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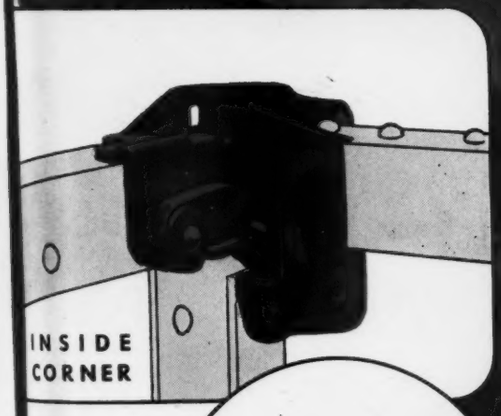

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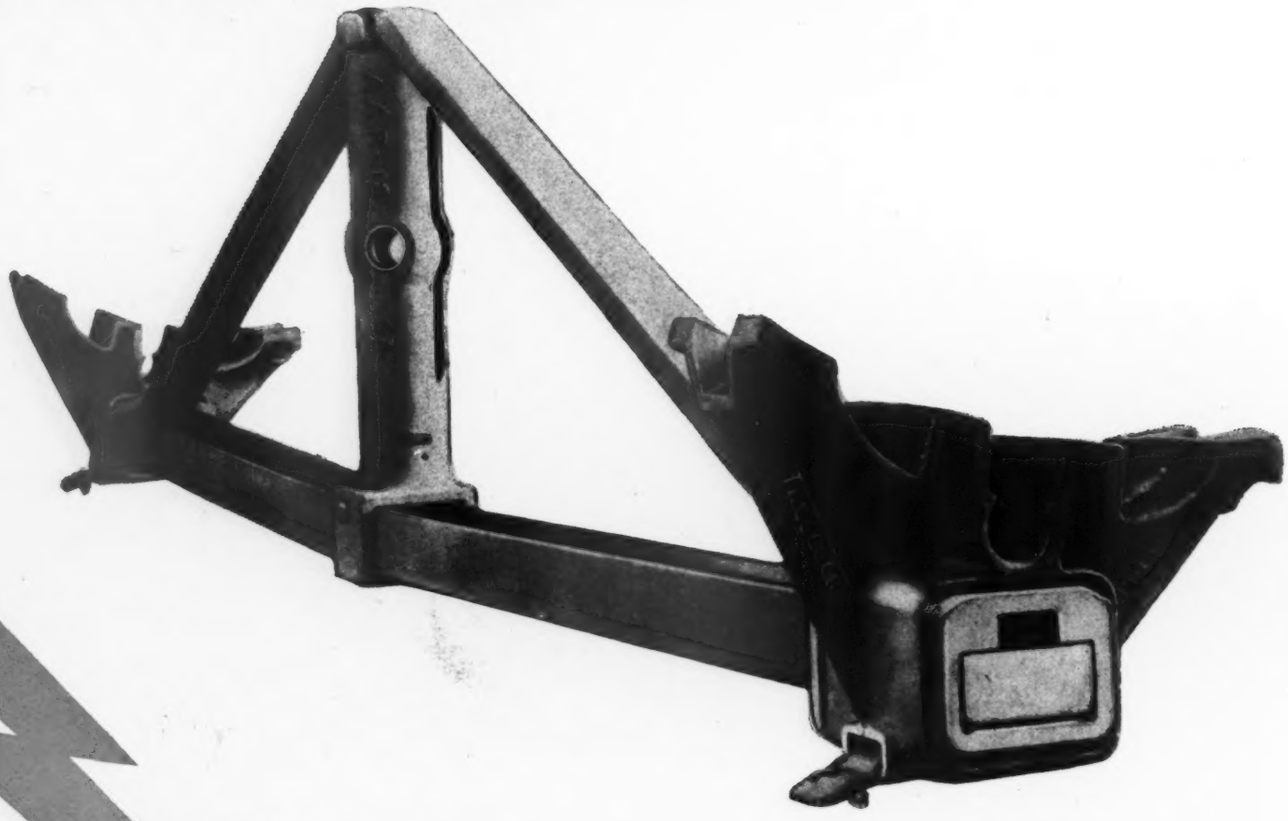

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Founded in 1832 as the American Rail-Road Journal.

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Published monthly by Simmons-Boardman Publishing Corporation
1309 Noble street, Philadelphia, Pa. Editorial and executive offices: 30 Church street, New York 7, and 79 W. Monroe street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D. C.; 1914 Minor avenue, Seattle 1, Wash.; 816 W. Fifth street, Los Angeles 13, Calif.; 1204 Russ bldg., San Francisco 4, Calif.; 2909 Maple avenue, Dallas 4, Tex.

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The Railway Mechanical and Electrical Engineer is a member of the Associated Business Papers (A.B.P.) and the Audit Bureau of Circulations (A.B.C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service. Printed in U. S. A.

Subscriptions payable in advance. Postage free. United States, U. S. Possessions and Canada, 1 year, $3. Other countries in Western Hemisphere: 1 year, $5. All other countries: 1 year, $7. 2-year subscriptions double the 1-year rate. Single copies 50 cents. Address Robert G Lewis, Asst. to Pres., 30 Church Street, New York 7.

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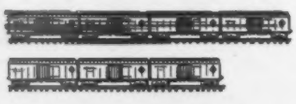

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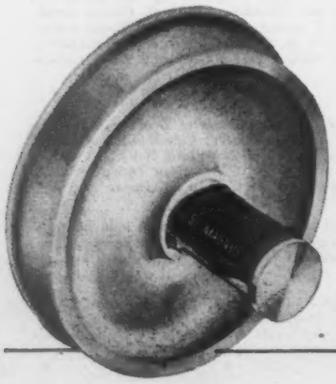

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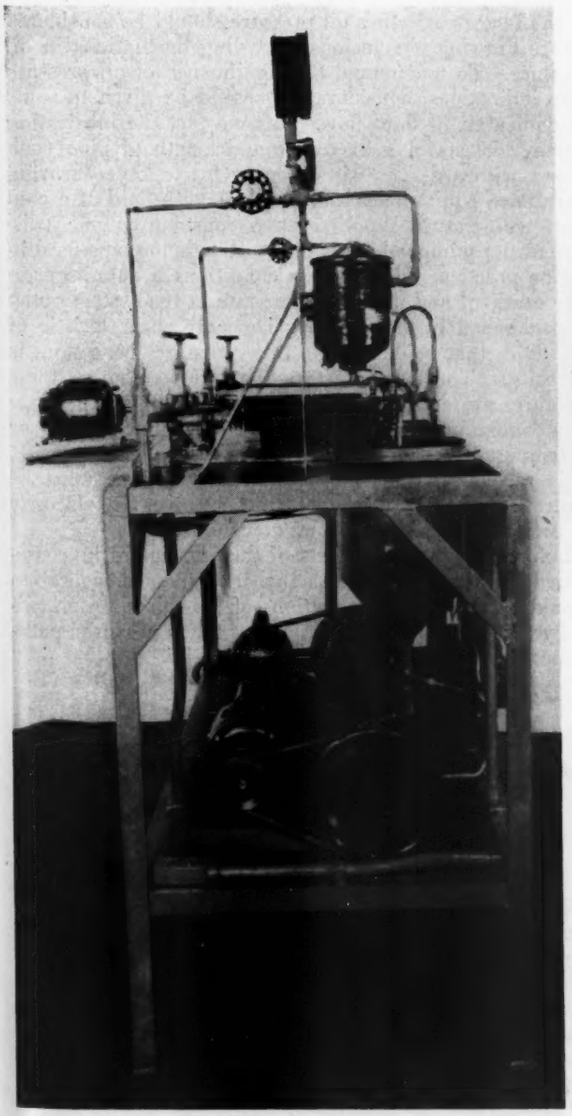
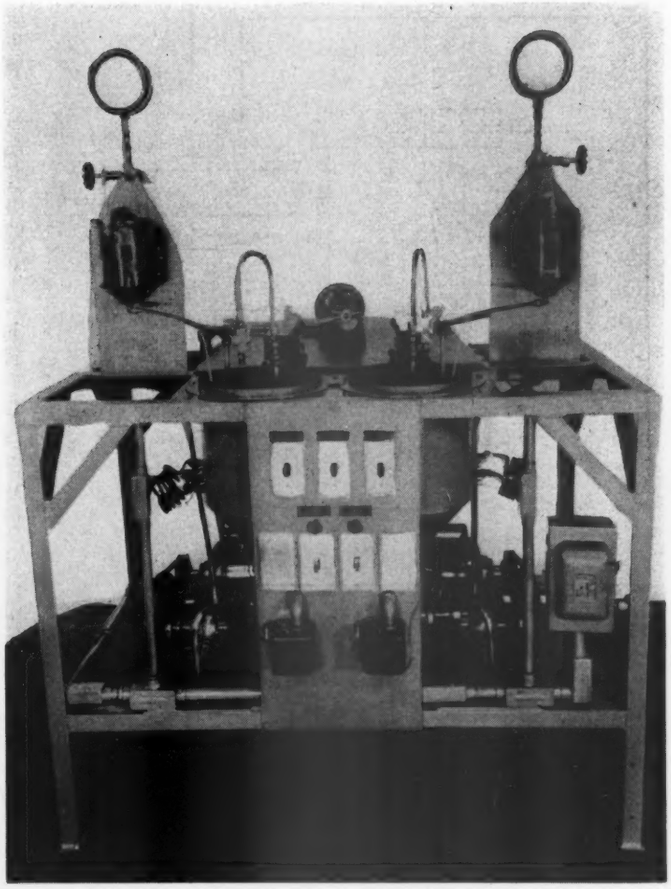
Engine Oil Pressure

By P. A. Binda†





Figs. 1 and 2—Laboratory equipment for studying engine-oil pressure

Part I

THE term "engine oil pressure" is often found in literature on engines, however, little is ever mentioned beyond stating a pound per square inch value at some speed condition for the particular engine involved. The question naturally arises as to why measure oil pressure continuously. The answer obviously is to note if oil pressure changes occur during engine operation; but the significance of these changes can sometimes be misinterpreted.

The lubrication system of an engine consists primarily of an oil pump and oil lines or galleries to feed bearings, timing gears, valve trains, cylinder walls and other lubrication points. To complete the system an appropriate relief valve is incorporated to confine the oil to the main galleries and to relieve peak cold oil pressures. If desired an oil filter may also be included in the system.

A variation is found in a system that incorporates a separate oil reservoir, otherwise known as a dry sump

* Abstract of a paper appearing in the Texas Company's technical publication Lubrication, March, 1951.

† Technical & Research Division, Texas Company.

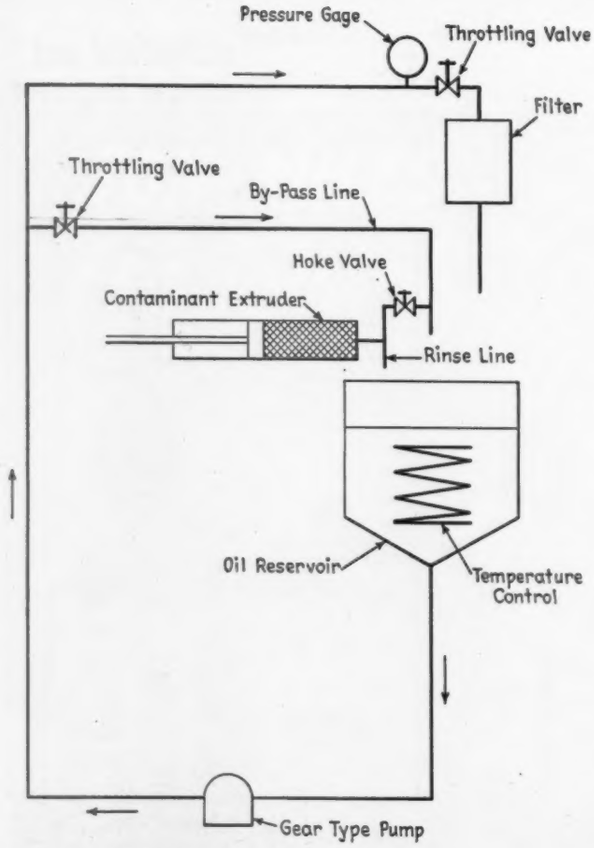


Fig. 3—Schematic diagram of an engine lubrication bench test

engine. Two separate oil pumps or a double pump in one body are used in this type of system.

Some engine manufacturers use a pressure system to all points except the connecting rod bearings and wrist pins. Connecting rod bearings are supplied with oil by equipping the rod bearing caps with dippers to scoop the oil from special troughs in the oil pan aided by impinging a stream of oil into the scoops by means of accurately aligned jets. In this system also it is obvious that oil flow rates are of major importance.

Large diesels usually have two separate oil systems. One system lubricates piston and cylinder liner walls while a crankcase system is used for lubrication of the remainder of the engine. Two different oils are usually used in this engine. Also, a secondary system is used on these engines to carry the crankcase oil to independent filtration equipment.

In all engines the oil is called upon to perform more than one service. The primary service is to maintain a continuous oil film between moving surfaces to prevent metal-to-metal contact. In addition the oil is required to carry away heat generated by friction (oil shearing), act as a piston-to-cylinder wall seal and in some cases to increase piston cooling. It is obvious that the rate of oil flow is an important factor if the oil is best to serve its intended purposes.

It is desirable to incorporate in an engine lubrication system some method of measuring oil flow. A variable closely related to fluid flow is pressure. Pressure gages are easy to incorporate in an engine lubricating system and are used as a means of assuring the operator that engine lubricating oil is flowing. However, it is difficult to

TABLE I—OIL VISCOSITY DATA

Oil Designation	*Viscosity, SUS At:* 100 deg. F.	130 deg. F.	210 deg. F.	*Viscosity Index*
P-6	1680	712	121	87
P-5	1220	475	93	88
P-4	830	348	78	91
P-3	547	242	67	97
P-2	331	156	54	96
P-1	172	93	44	98
N-6	1690	510	78	<0
N-5	1178	384	69	<0
N-4	764	280	60	<0
N-3	565	218	55	8
N-2	315	135	48	19
N-1	205	100	44	20
P-3C	523	235	66	102
N-4A	704	280	66	63
N-3S	691	247	57	<0

interpret pressure gage indications as rates of oil flow since many factors affect oil pressure in an engine.

The factors affecting oil pressure should be considered before drawing conclusions regarding fluctuations in oil pressure. To understand the significance of oil pressure gage indications, consideration should be given to some fundamentals of fluid flow. Assume that the lubrication system consists of a fixed size and length of pipe (galleries) with a definite size opening for leakage (bearing clearances, squirt holes and by-pass) with fluid at a constant temperature supplied by a constant volume (displacement) pump, which is the most common type used in engine practice. Under these conditions a definite pressure gradient and discharge pressure at the system outlet is established in the system. The only characteristic of the fluid that will change this pressure condition is viscosity. The other factors that would change these pressures are of a mechanical nature (change in leakage by a change in discharge outlet size or volume supply) or in temperature which again would only affect viscosity. It is recognized that pump discharge volume must be controlled in such a system since changes in viscosity or pressures affect pump output volume.

Before studying the effects of these variables in a simplified oil system or in actual engines, consideration should be given to the equations of fluid flow. A simplified version of the flow equation for fluids in closed paths (pipes) under laminar flow condition is:

$$V = \frac{PD^2}{CN} \qquad (1)$$

where V = Flow (volume)
P = Pressure change along flow path
D = Pipe diameter
C = Constant for proper dimensions
N = Viscosity

This equation states that laminar fluid flow in closed paths varies directly with pressure gradient and pipe diameter and inversely with viscosity. Also, a change in path diameter has a greater effect on the flow than either pressure drop or viscosity changes since flow varies as the square of the diameter. This equation is applicable in determining coefficients of rischarge for some types of orifices and by-pass outlets.

Considering the positive displacement pump usually found in an engine lubrication system, its performance can be described by the following equation:

$$V = Vp - Vs - Vc \qquad (2)$$

where V = Actual delivery
Vp = Physical pump displacement delivery
Vs = Slip losses
Vc = Cavitation losses

This equation merely states that the actual delivery is equal to the delivery based on the physical capacity and speed of the pump less slip and cavitation losses. The slip losses may be quite large since they are similar to laminar fluid flow between flat parallel plates. The equation for this condition is:

$$Vs = \frac{PBT^3}{12CNL} \qquad (3)$$

where Vs = Flow between close flat parallel plates
P = Pressure change along path
B = Width of passage
T = Clearance between plates
C = Constant for proper dimensions
N = Viscosity
L = Length of passage

This equation states that laminar flow between flat parallel plates varies with pressure gradient and viscosity in a manner similar to laminar flow in pipes, however, changes in clearance between plates, cubed functions, have a greater effect on flow than changes in pipe diameter. This equation may be applied in determining oil flow through bearing clearances.

The cavitation losses in an engine oil system under normal engine operating conditions are usually negligible. These losses can become detrimental, however, in cases of severe foaming or improper oil viscosity.

Since oil viscosity varies inversely as a function of temperature and this fact will be considered in the subsequent discussion, the viscosity-temperature relationship of two pairs of oils, of widely different viscosity and viscosity index has been included for information purposes. The relationship is not linear, an important fact. In the lower temperature range large changes in viscosity are experienced with small changes in temperature while at the higher temperatures the reverse is true.

Laboratory Simulated Lubrication System

To study some variables associated with engine lubricating oil systems in simplified laboratory equipment the units shown in different views as Figs. 1 and 2 were used. This equipment consists of two completely independent units. The schematic diagram of the individual units is shown as Fig. 3.

Each test unit consists, essentially, of a cylindrical reservoir with a conical bottom containing thermos-statically controlled heating coils, a constant volume (gear) pump, a by-pass line with a throttling valve to control pressures in the system, a filter line and an accurately-metered contaminant extruder so that the unit can be used for evaluating oil filters. The extruder was not used for the work presented herein. The units are such that they can be readily modified.

The oils used in this bench test type evaluator and in the engine tests to be discussed later are shown as Table I along with their viscosities and viscosity indices. It is pointed out that both naphthene and paraffin oils covering a wide range of viscosity grades and viscosity indices were included.

By using the test apparatus shown in Fig. 4 with the

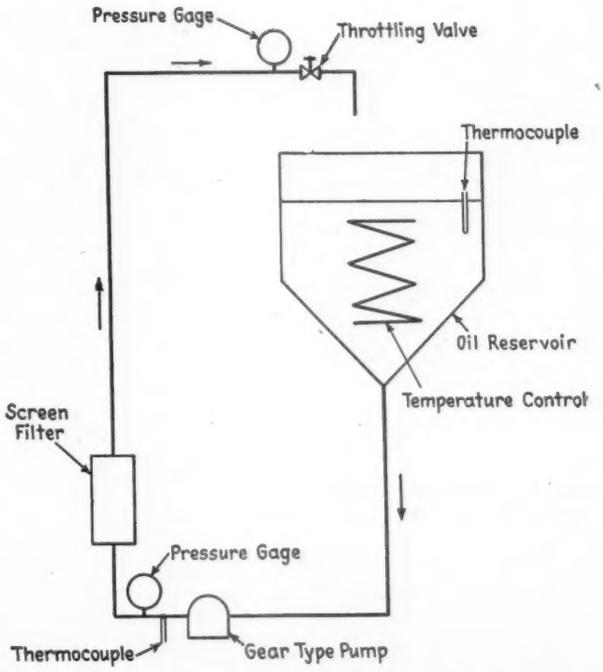


Fig. 4—Arrangement of a modified engine lubrication test system

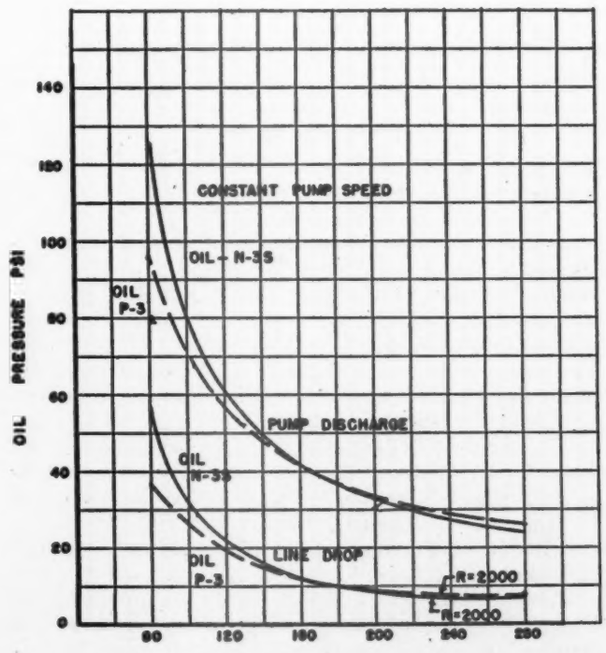


Fig. 5—Oil-pressure-temperature relationship for a simulated lubrication system

throttling valve used to restrict flow we have essentially the pipe arrangement assumed earlier in this article. Tests were carried out using two oils P-3 and N-3S (Table I) whose Saybolt viscosities were approximately equivalent at 130 deg. F. In the first test, pump speed was kept constant and oil temperatures at pump discharge were varied from 80 deg. F. to 280 deg. F. Essentially, oil viscosity was varied. The resulting pump discharge pressures and pressure drops through the line are shown as Fig. 5. These curves show that discharge pressures and line pres-

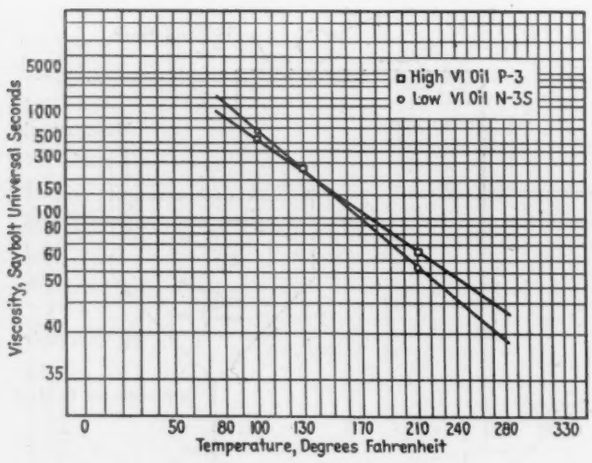


Fig. 6—Viscosity-temperature relationship for two typical oils

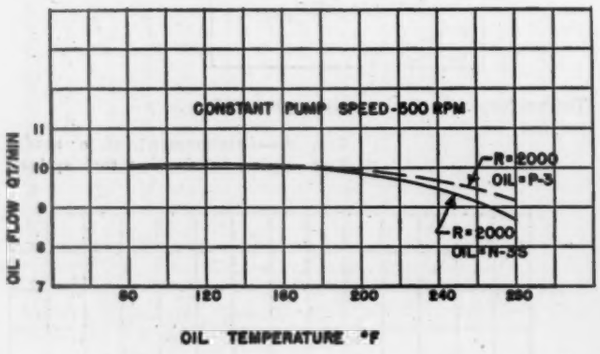


Fig. 7—Oil-flow rates for a simulated lubrication system

sure drops decreased with increased temperature (decreased viscosity). The low VI oil N-3S showed substantially greater discharge pressures and line pressure drops than the high VI oil P-3 in the 80 deg. F. region, but both oils were almost equivalent from 105 to 280 deg. F. These results appear logical in view of the viscosity of the low VI oil being 600 SU seconds greater at 80 deg. F. than that of the high VI oil while at 280 deg. F. the low VI oil is only 5 SU seconds lower than the high VI oil. This may be seen from the temperature-viscosity relationship of these oils, shown as Fig. 6. It may be noted that the absolute viscosities of the oils were equal at the respective oil temperatures where discharge and line drop pressures were equal.

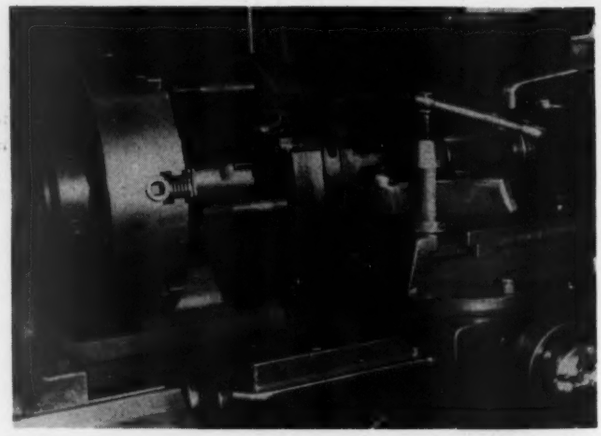
The oil rates determined in this test are shown as Fig. 7. The dimensionless quantity known as Reynolds Number (R), a parameter which characterizes the relative importance of viscous action, was computed for the severest condition based on viscosity of the oil at the pump discharge oil temperature. It was found on this basis that oil flow was laminar up to the points R indicated on the curves of Figs. 7 and 5. These are the Reynolds Number values of 2000, otherwise known as the lower limit below which flow disturbances of any magnitude are eventually damped by viscous action. All flows were below the upper critical Reynolds Number value of 12,000 or, in other words, instability of flow was not encountered.

From the equation of flow (1) it can be seen that for constant flow and pipe size, line pressure changes and consequently discharge pressures vary with viscosity. Since viscosity varies inversely as a function of temperature, then, in this equipment the oil pressure-temperature relationship curves should follow the same trend as the viscosity-temperature curves.

Mandrel To Face Diesel Engine Heads

The facing of a diesel engine head bottom and ring joint has been simplified by a mandrel built at the Oelwein, Iowa, shops of the Chicago Great Western. The design of the mandrel is such that it is easily applied to and centered in the lathe. It is relieved so that the facing can be done on the head without removing the overspeed trip, the rocker arm bracket or index.

The application of the mandrel to the lathe is simple. The mandrel shaft slips in the spindle and an enlarged section of the shaft is grabbed by the chuck jaws. The lathe dead center fits in the injector hole to support the other end of the assembly. The head is applied to the mandrel by inserting the two rocker arm studs through appropriate holes in the mandrel plate.



Application of the head to the mandrel for facing the ring joint

The mandrel is relieved to avoid removal of the overspeed trip, the rocker arm bracket or index from the head

Left to right, tank for cleaning diesel-engine parts; the filter cleaning, rinsing and oil tanks, and filter drying oven

How the Western Maryland Cleans Air Filters

With the passing of the era of steam and the adoption of diesel-electric powered engines, the maintenance problems have become greater and more pressing. One of the maintenance problems confronting the mechanical department is that of cleaning. In the past, when steam locomotives prevailed, cleaning in the repair shop consisted mainly of soaking engine parts in a large vat of boiling alkai. In most cases this was entirely adequate as the parts to be cleaned were heavy cast iron units which were unharmed by strong alkaline solutions.

The problems of cleaning diesel engine parts differs extensively from those encountered in the cleaning of steam locomotive parts. The well-known "lye vat" had to give way to more modern cleaning compounds and methods of cleaning because of the variety of easily attacked metals and alloys used in the construction of the engine parts, the close tolerances and highly finished surfaces of these parts and the tenacious nature of the soil deposits resulting from the operation of internal combustion engines.

The Western Maryland at Hagerstown, Maryland, realized that to keep its diesel power on the road with "lay up" time cut to a minimum, mechanized cleaning of component locomotive parts would be a necessity. Too, they realized that the elimination of excessive labor costs for cleaning would be a direct result of the use of mechanical cleaning equipment and specialized cleaning compounds.

In determining the type of cleaning equipment and method best suited to their needs, several factors had to be given careful consideration. As both engine parts and air filters were the main units to be cleaned, equipment to handle both these dissimilar parts were needed. The equipment had to be compact because of space limitations. Because of the difference in the nature of the soil on the engine parts and filters, two kinds of chemical cleaners had to be used. The equipment had to be of the type that could be used intermittently without costly, time-consuming preparation.

The cleaning room as finally planned, built and equip-

▲ A basket load of 18 air filters being lowered into mechanically agitated filter cleaning solution. Cleaning time, 1½ min.

Filters draining after a few seconds' immersion in the hot-oil dip tank. Excess oil is allowed to drain back into tank ➤

▼ A batch of 18 filters being agitated in a solution of Magnus Super SL

▲ Filters being removed from the rinsing tank after an immersion time of 1 min.

▼ The drying oven where the filters are placed for final drying after oiling

ped is located in one end section of the existing engine house, partitioned off from the rest of the house which, has been converted into a modern diesel overhaul shop.

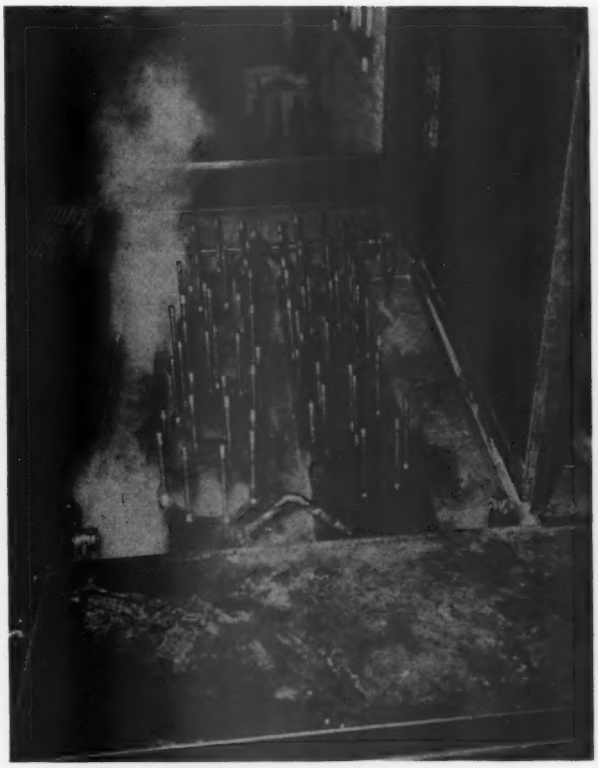
The Western Maryland cleaning room is itself a model of cleanliness and the equipment handles all diesel parts cleaning and filter cleaning, rinsing, oiling, drying and storing operations. It consists of one Magnus Aja-Dip cleaning machine No. 6 for cleaning diesel engine parts; two Magnus Aja-Dips No. 4, one for cleaning filters and one for rinsing filters; one Magnus Hot-Oil dip tank and one Magnus drying oven.

Before the installation of the above cleaning equipment, cleaning diesel parts and air filters required 24 man-hours a day (3 men—8 hours per day). Parts cleaning was done in an open tank in which the parts were immersed in cleaning solution and left for several hours or a full day to clean. Filters were cleaned by dipping individual filters in an open tank and then rinsing with steam . . . a time-consuming, hand operation. Not only were their former cleaning methods costly, but the actual cleaning results left much to be desired. Much time was unnecessarily consumed in handling parts and filters in and out of the cleaning tanks individually.

With the present set-up of Magnus cleaning equipment, efficiency is at a high level. Cleaning time for both diesel parts and air filters has been cut to 4 man-hours per day—a saving of 20 man-hours. It has released two employees for other work and also makes available for other work 4 hours per day of the cleaner.

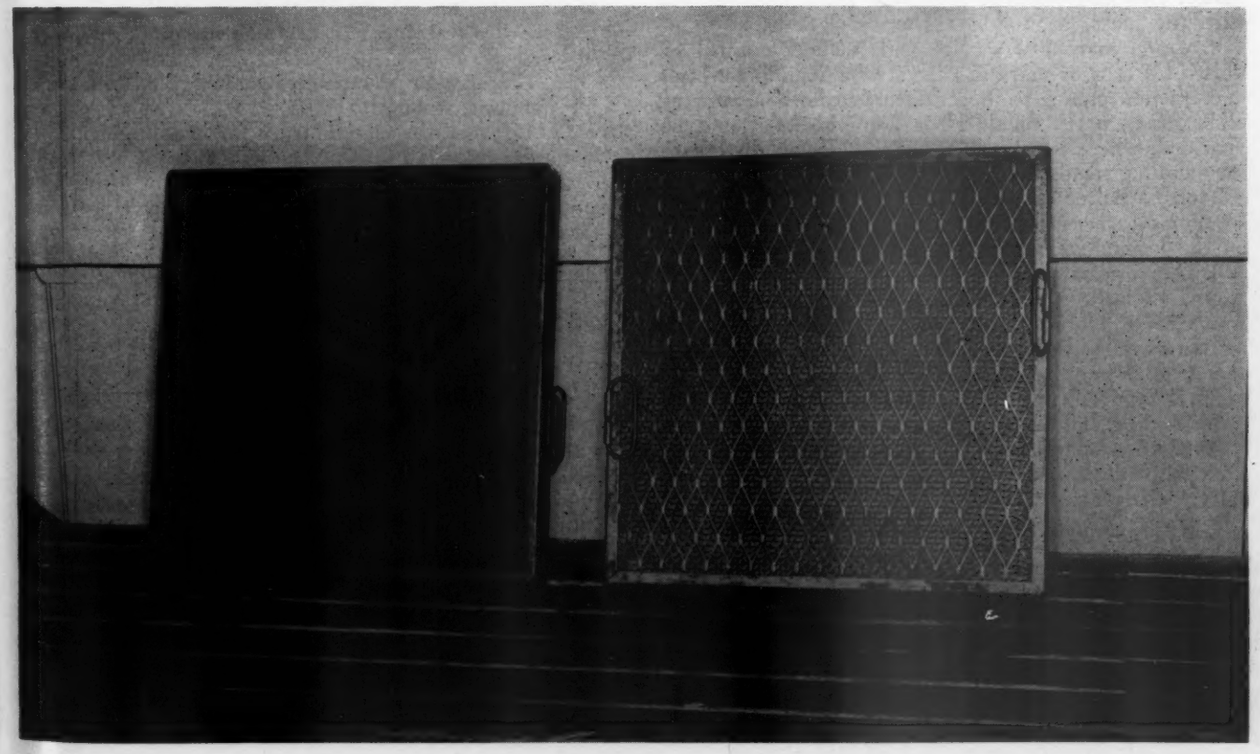
Individual handling of parts and filters has been entirely eliminated throughout the cleaning operations. As the engine that is being overhauled is dismantled, the parts to be cleaned are loaded directly into perforated baskets that fit the platform of the No. 6 Aja-Dip cleaning machine. An overhead, electric hoist picks up the baskets of parts and places them in the machine, containing Magnus decarbonizing compound heated to 140 deg. F. A touch of the starting button puts the agitating mech-

(*Continued on page 58*)



▲ A load of 10 cylinder liners being cleaned in a decarbonizing compound

▼ Two flat filters from the same engine. The filter on the left is before cleaning; that on the right, after cleaning and rinsing



Facilities for Diesel Repairs*

By R. H. Herman†

Working platform, storage cupboards and racks in extended portion of a converted enginehouse

THE following list covers the principal items of machinery and equipment for routine or progressive maintenance work. A shop for a relatively few number of locomotives will not require a complete set of such equipment since portable equipment can be borrowed or the work sent to other shops for routine test or overhaul.

1. Equipment for changing pair of wheels and traction motor. This may comprise pneumatic jacks, motor-driven high lift jacks, drop table or transfer table.

2. Crane and hoist service will include a crane or hoist of 5 tons or more in capacity for handling wheels and traction motor, main generator, steam generator or other heavy parts. Small 1- or 2-ton hoists should be provided, where necessary, on monorails or jib cranes for handling smaller parts. It may be desirable to provide a 2-ton or larger overhead traveling crane over the inspection pit tracks for handling parts through the hatches on the locomotive roof.

3. One or more engine lathes for machining operations, 12 in. to 30 in. swing.

4. One or more drill presses at convenient points in the parts reconditioning room and on working platform.

5. One or more double emery grinders of bench or pedestal type at convenient locations.

6. Welding and battery chargers of the portable type. A standard welding set of 400 ampere capacity may be equipped with necessary meters and relays for emergency battery charging.

7. A 20- to 50-ton hand or motor-operated hydraulic press for bushings, small shafts, etc.

8. One or more portable flexible shaft grinders and buffers.

9. Pipe cutting and htreading machine for pipe up to 2 in., with drive shaft and dies for larger pipes.

10. Air brake test benches with plates and accessories for all types of air brake equipment.

11. Speed recorder tester.

12. Hypot test outfit, 0-300 volts with circuit for burning out grounds.

13. Power and torque wrenches for crab nuts, main bearing cap nuts and similar applications.

14. Equipment for cleaning heads, liners, pistons, connecting rods, etc. This may consist of cleaning vats and rinse tanks in a small shop or agitating dip cleaning and rinse tanks in a large facility.

15. Equipment for cleaning and oiling air filters. Solution, rinse and oil tanks may be used with steam heated ovens in a small shop. In a larger shop appreciable labor savings can be realized by installing a continuous conveyor type cleaning machine and centrifugal oiler or a combination batch type cleaning and oiling machine.

16. Magnaflux, Magnaglo and Zyglo equipment for testing axles, gears and pinions, rods, pins, bushings, valves, pistons, heads and other highly stressed parts.

17. Test stand for engine governor.

18. Impact wrenches for various applications.

19. Megger tester, voltmeter, ammeter, ohmmeter and instruments for electrical work as well as testing.

20. Valve seat and face grinding machines and accessories.

21. Gasoline or electrically-operated platform trucks for handling material.

22. Lift platform electric truck for handling skids and batteries.

23. Pneumatic jacks of 50 ton capacity for lifting locomotive cab when dropping wheels or inspecting center castings.

24. Tachometers and speed indicators for checking engine speed.

25. Injector test equipment.

26. Hand carts of various types for handling cylinder assemblies, filters and other frequently used parts.

27. Small MG set for testing meters and relays.

28. Equipment for lube oil reclamation in a large shop with storage tanks and pumping equipment for new and reclaimed oils.

29. Equipment for tests of viscosity and condition of lube oil from Diesel engine crankcases, supplementing regular laboratory analysis. It may even be desirable at a large shop to provide a branch chemical laboratory to permit a close check of lube oil condition or contamination.

30. Equipment for cleaning radiator and oil cooler

* The third of several articles which constitute an abstract of material appearing in the 1951 Edition of the Locomotive Cyclopedia, Shop Section

† Engineer Shops and Equipment, Southern Railway System

cores with small amount of equipment for sheet metal work.

31. Oxy-acetylene welding equipment.

32. Induction heater for inner bearing races on locomotive.

33. Pinion heater and hydraulic pinion puller with accessories for mounting and dismounting traction motor pinions if required.

34. Necessary hand tools, special jigs and tools, fixtures and devices for Diesel repair operations.

Servicing Facilities for Routine Maintenance

The following facilities will be required in conjunction with the well designed maintenance shop.

1. Washing platform with concrete walkways and reinforced concrete walkways and reinforced concrete supporting track long enough for a complete locomotive or several locomotives in a large operation. Service outlets should be provided for cold water, steam, compressed air, cleaning solution for trucks and underframe and the entire area should be well lighted. If the number of locomotives handles justifies the expenditure a rotating brush-type washing machine is very desirable.

2. An outside inspection pit, well lighted and drained, for turnaround inspections.

3. Sanding facilities including wet sand storage, sand dryers of steam, coal or oil fired type, elevated dry sand tanks with piping, hoses and nozzles to reach sand boxes on locomotive units. Elevated walkways at each side of the track are very convenient.

4. Water treating system for boiler and engine cooling which may cover water distilling equipment, demineralizer, softener or chemical treating tanks, complete with necessary storage tanks, pumps and pipe system to convenient locations on wash platform, inspection pit or in the maintenance shop.

5. Fuel oil storage, pumping and piping system to supply fuel oil to locomotive units on washing or outside servicing platforms. It is desirable that storage be sufficient to cover 60 days' consumption in event an emergency affects deliveries of oil. Duplicate pumping units of 100 to 300 or more gal. per min. capacity should be provided with intake screen filters, and large renewable element filters on the discharge. Some recent installations have been made using submerged turbine or centrifugal pumps, but common practice favors a rotary pump.

6. Lube oil storage, pumping and piping system. In a small shop lube oil changes in Diesel engines can be handled satisfactorily by pumping by hand from drums, but a shop of any size should have a complete pipe system throughout the shop with storage tanks and pumps to supply lube oil by hose and nozzle direct to the filling sump on the Diesel engine. The storage tank or tanks should be of adequate size to permit unloading of a complete car of oil at one time and should be steam heated. Pumps should be of the rotary type, motor driven, with a capacity of 30 to 60 gal. per min. depending on the number of outlets to be used at one time.

The outlets may consist of hose and nozzle suspended from an upright pipe, or a hose reel which will handle up to 50 ft. of hose, located at convenient points on the platform. Each outlet should be provided with an integrating or ticket printing meter for accurate record of the amount of lube oil supplied to each engine.

A pressure system for supply of lube oil eliminates frequent starting and stopping of manually controlled pumps. A pressure tank is used with approximately one-third of the tank filled with compressed air. When any supply valve is opened oil flows due to the expansion of air until the pressure drops to a predetermined point, at which the lube oil pump is started by a pressure switch.

7. A dirty lube oil system is also essential, with suction outlets under the platform, connected by hoses to engine sump and oil filter drain, with a pipe system to a rotary pump. The pump develops a suction in the system, draws dirty lube oil back and discharges it into a storage tank. At intervals the oil is pumped into barrels for shipment or to a reclaiming plant for reconditioning.

The clean and dirty lube oil lines should be installed together, with a small steam tracer line in between, all wrapped with blanket insulation. The steam line can be thermostatically controlled to maintain oil temperature high enough for easy flow.

8. A treated water system should also be provided in the larger shops for engine cooling water. The treatment generally used is costly and it has proven economical to salvage and reuse cooling water, when necessary to remove it for liner or other engine maintenance work.

The shop can be provided with two pipe systems, pumps and storage tanks to permit this water to be salvaged and reused. The water is pulled back from the locomotive, when not contaminated with oil, and discharged into a storage tank. The amount of treatment is checked, chemicals or water added and the water pumped into a treated water supply tank. From this tank, a pump delivers it to outlets at convenient points on the platforms for adding to or filling the engine cooling system. A pressure tank arrangement is also desirable on the treated water system.

9. An acid boiler wash system is desirable in a shop handling a large number of passenger Diesel locomotives having steam generators. A permanent piping system of copper or bronze can be provided and the acid washing unit permanently installed. The acid is circulated by the pump through the pipe system and steam generator coils and returned to the storage tank. This arrangement eliminates haulage of a portable acid washing unit from one platform to another with its attendant hazards.

10. Adequate fire protection is important and it should be provided by hydrants outside with foam protection, fog spray and carbon dioxide extinguishers inside.

11. Adequate ventilation must be provided to remove fumes and exhaust gases from the building. In the early shops, jacks or low hoods were used but proved to be unsatisfactory. Most shops now being built utilize motor driven or gravity ventilators on the roof to exhaust fumes. In sections of the country where climate is severe the incoming air should be tempered by heaters and admitted below the platforms for best circulation. This is not essential where winters are mild.

12. The building should be well lighted with battery charging and welding receptacles, extension cord receptacles, and steam, water and compressed air outlets at convenient points.

13. A paint shop for Diesel locomotive units is a very desirable feature at a large progressive maintenance shop since it will no doubt be necessary to paint cabs, etc., before locomotive is shopped for heavy repairs.

14. Ramps and stairs should be provided at convenient points for passage of employees or haulage of material from one level to another. An elevator or hydraulic lift is economical for transporting material in a large shop.

15. It is essential that provisions be made for a storehouse as close as practicable to the Diesel shop. Platform should be provided for loading and unloading material from cars or trucks, with passageway from these platforms to the maintenance shop.

(To be continued)

16. A communications system consisting of loud speakers with talk-back arrangement or telephones at convenient locations about the shop and terminal area is essential in a large shop. The master control station should be located in the shop office but it should be possible to make announcements over the speaker system from any telephone.

17. In colder areas of the country some means should be provided for thawing or melting ice or snow from trucks and underframe. This can be accomplished by hot air outlets in the pit or a portable de-icer unit operating inside the inspection pit.

Cleaning Diesel Air Filters

(Continued from page 55)

anism into motion, agitating the basket load of parts up and down in the cleaning solution 54 times a minute. After the short cleaning period, the parts are given a steam rinse and returned to the repair crew.

While the diesel parts are being cleaned (one to three hours depending upon the tenacity and amount of varnish and carbonized oil on the parts) the operator is free to clean air filters.

As the filters are removed from the engine, they are placed in perforated baskets designed to fit the No. 4 Magnus Aja-Dip filter cleaning machine. A basket load consists of 18 filters. From the time the filters are placed in the baskets until final drying has been completed the 18 filters are handled as a unit and do not require individual handling.

The overhead electric hoist and trolley places the basket of filters in the No. 4 Aja-Dip where they are agitated for 1 to 1½ minutes in a water solution of Magnus Super SL cleaning compound. The reversing, up and down motion of the filters forces the cleaning solution through the filters from all directions, effectively loosening and carrying away all impinged dirt deposits, resulting in thoroughly cleaned filters, corner to corner; through and through.

At the end of the 1- to 1½-minute cleaning period, the basket of filters is removed from the cleaning machine and placed in the next Magnus No. 4 Aja-Dip. Here they are given an agitated rinse in hot water for one minute. From the rinsing machine the filters are dipped for less than one minute in the heated oil bath contained in the Magnus hot oil dip tank. After a short period to allow excess oil to drain back into the tank, the filters are moved to the Magnus drying oven. Excluding drying time (approximately 15 minutes) the cleaning, rinsing and oiling operations consume the unbelievingly short time of less than 5 minutes.

Filters that have just been cleaned are not put back in the same engine from which they were removed as a supply of extra, cleaned and dried filters is kept in stock. To stock recently cleaned filters, the Western Maryland designed and built an ingenious storage bin. The drawers of the cabinet rock open, making the filters easily available. Additional storage place is provided at the top of the cabinet for storing round-type filters. The storage cabinet is gas heated to prevent stored filters from picking up atmospheric moisture.

On the Western Maryland filters are changed frequently on all engines, the frequency of replacement depending upon the type of service in which the engines are placed. With the present air filter cleaning procedure, it is possible ot keep well ahead of the need for clean filters because of the efficiency and speed with which filters are cleaned.

Applies and Holds Piston Clearance Leads

Both the taking and the recording of diesel engine piston clearance leads are simplified by a small device which holds the leads and which is numbered to correspond with the cylinder number on which the particular clearance lead is being taken.

The leads are bent into a Z shape with a 3-in. upper bar and a small lower bar. The small bar fits in a pair of ⅛-in. holes near the ends of a thin metal strip ½ in. by 5 in. A ¼-in. rivet ⅜ in. long is soldered in the center of this thin metal strip and drops into the center hole in the top of the piston.

The rivet serves also as the means by which the strip is applied for taking the leads. A rod ¼ in. by 18 in. with a Y shaped end lifts the strip by the head on the rivet. The end of the rod slips into the space between the bottom of the rivet head and the top of the strip. The strip is then applied through an air port in the bottom of the liner when the piston is on or near bottom dead center.

Sixteen such devices are used, one for each cylinder, to take the leads on a complete diesel engine.

How the lead holder takes piston clearance leads is shown above with the piston removed from the engine. In practice, the holder is inserted through the cylinder port

Diesel-Electric Locomotive Units In Railway Service

Class I railroads' Diesel-electric locomotive inventory increased by nearly 30 per cent in number of units and more than 30 per cent in horsepower in 1950

As of December 31, 1950, there were 15,340 Diesel-electric locomotive units in railway service, of which 14,147 units were owned by Class I, line-haul railroads, in the United States (excluding switching and terminal companies).

The Diesel-electric locomotive inventory of Class I, line-haul railroads, was increased by 3,174 units, totalling 4,432,137 hp.—from 10,973 units aggregating 14,009,850 hp. as of December 31, 1949, to 14,147 units, totalling 18,441,987 hp. as of the same date in 1950. This increase included 11 units of 2,500 hp.; 100 units of 2,250 hp.; 11 units of 2,000 hp.; 283 units of 1,600 hp.; and 1,792 units of 1,500 hp.

Switching and terminal companies and Class II and III railroads owned 1,193 Diesel-electric units aggregating 1,072,677 hp. as of December 31, 1950.

The Diesel-electric locomotive units in service on Class I, line-haul railroads (excluding switching and terminal companies), as of December 31, 1950, were as follows:

Number of Units	Horsepower Each Unit	Total Horsepower
36	3,000	108,000
11	2,500	27,500
119	2,250	267,750
1,275	1800 or 2000	2,543,200
283	1,600	452,800
5,647	1,500	8,470,500
1,173	1,350	1,583,550
5,603	1,200 or less	4,988,687
Total 14,147		18,441,987

A similar tabulation was published in the May 27, 1950, issue of the *Railway Age* and the July, 1950, issue of *Railway Mechanical and Electrical Engineer*, covering Diesel locomotive statistics for the previous year.

DIESEL-ELECTRIC LOCOMOTIVE UNITS IN SERVICE ON CLASS I RAILWAYS

Excluding Switching & Terminal Companies—As of December 31, 1950

Railroad	Number of Units in Various Horsepower Classes*								Total	
	3000	2500	2250	1800 or 2000	1600	1500	1350	1200 or less	Units	Horsepower†
Akron, Canton & Youngstown	....	....	....	4	....	1	....	2	7	11,500
Ann Arbor	....	....	....	....	14	....	....	9	23	28,720
Atlanta & St. Andrews Bay	....	....	....	....	....	1	....	12	13	13,500
Atlanta & West Point—W. of Ala.	....	....	....	....	....	10	....	6	16	21,000
Atlantic & Danville	....	....	....	....	....	6	....	....	6	9,000
Atchison, Topeka & Santa Fe	....	....	....	66	1	336	320	244	967	1,299,830
Atlantic Coast Line	....	....	5	59	....	101	72	43	280	422,750
Baltimore & Ohio	....	....	8	44	....	224	24	213	513	674,160
Bangor & Aroostook	....	....	....	2	....	32	....	4	38	56,000
Bessemer & Lake Erie	....	....	....	....	....	21	....	2	23	33,030
Boston & Maine	....	....	1	21	....	34	68	70	194	238,950
Central of Georgia	....	....	2	10	....	19	....	25	56	74,980
Central of N. J.—Cent. of Pa.	....	....	....	6	12	44	....	43	105	133,460
Central Vermont	....	....	....	....	....	....	....	3	3	3,000
Charleston & W. Carolina	....	....	....	....	....	14	....	2	16	23,400
Chesapeake & Ohio, incl. P.M.	....	....	....	12	16	90	....	145	263	332,980
Chicago & Eastern Illinois	....	....	....	3	....	56	....	24	83	109,400
C. & N. W.—C. St. P. M. & O.	....	....	4	42	....	157	8	167	378	477,510
Chicago, Burlington & Quincy	....	....	22	58	....	123	74	171	448	610,400
Chicago Great Western	....	....	....	9	....	76	....	42	127	169,715
Chicago, Indianapolis & Louisville	....	....	....	....	....	47	....	10	57	79,700
Chicago, Milwaukee, St. P. & Pac.	....	....	....	35	....	122	52	147	356	453,540
Chicago, Rock Island & Pacific	....	....	1	31	15	89	48	152	336	396,360
Clinchfield	....	....	....	....	....	22	....	6	28	40,200
Colorado & Southern	....	....	....	2	....	12	....	5	19	27,200
Colorado & Wyoming	....	....	....	....	....	....	....	3	3	3,000
Columbus & Greenville	....	....	....	....	....	5	....	2	7	8,632
Delaware & Hudson	....	....	....	....	....	49	....	50	99	123,500
Delaware, Lackawanna & Western	....	....	....	....	....	59	20	54	133	155,040
Denver & Rio Grande Western	....	....	....	6	....	79	48	37	170	226,760

* Number of Units Based on A. A. R. Statistics. † Horsepower Compiled by the Simmons-Boardman Publishing Corporation.

DIESEL-ELECTRIC LOCOMOTIVE UNITS IN SERVICE ON CLASS I RAILWAYS—CONTINUED

Railroad	Number of Units in Various Horsepower Classes								Total	
	3000	2500	2250	1800 or 2000	1600	1500	1350	1200 or less	Units	Horsepower
Detroit & Mackinac	....	....	....	....	....	6	....	1	7	9,660
Detroit & Toledo Shore Line	....	....	....	....	....	....	....	3	3	3,600
Detroit, Toledo & Ironton	....	....	....	....	....	....	....	14	14	14,200
Duluth, So. Shore & Atlantic	....	....	....	4	4	....	....	7	15	21,000
Elgin, Joliet & Eastern	....	....	....	32	....	10	....	107	149	169,900
Erie	....	....	....	12	24	154	24	125	339	441,280
Florida East Coast	....	....	....	26	....	18	....	...	44	79,000
Ft. Worth & Denver City	....	....	2	2	....	12	....	5	21	31,100
Georgia & Florida	....	....	....	....	....	6	....	3	9	10,800
Georgia	....	....	....	....	....	10	....	8	18	23,000
Grand Trunk Western	....	....	....	....	....	22	....	36	58	67,700
Great Northern	....	....	....	13	....	205	96	110	424	570,860
Green Bay & Western	....	....	....	....	....	9	....	4	13	16,420
Gulf Coast Lines	....	....	....	2	....	44	....	16	62	84,050
Gulf, Mobile & Ohio, incl Alton	....	....	....	17	8	153	....	65	243	339,740
Illinois Central	....	....	4	22	....	2	4	102	134	163,980
Illinois Terminal	....	....	....	....	....	....	....	19	19	19,000
International-Great Northern	....	....	2	4	....	36	....	11	53	74,760
Kansas City Southern	....	....	....	11	....	47	....	35	93	129,160
Lake Superior & Ishpeming	....	....	....	....	....	5	....	...	5	7,500
Lehigh & Hudson River	....	....	....	....	11	....	....	...	11	17,600
Lehigh & New England	....	....	....	....	....	26	....	7	33	45,440
Lehigh Valley	....	....	....	14	10	56	8	92	180	223,660
Long Island	....	....	....	8	....	1	....	45	54	55,240
Louisiana & Arkansas	....	....	....	3	....	22	....	12	37	51,000
Louisville & Nashville	....	....	....	28	....	67	....	107	202	245,720
Maine Central	....	....	....	7	....	23	....	25	55	66,360
Midland Valley-K. O. & G.-O. C.-A.-A	....	....	....	....	....	6	....	1	7	10,000
Minneapolis & St. Louis	....	....	....	....	....	14	9	43	66	72,950
Minneapolis, St. P. & S. Ste. M	....	....	....	....	....	76	....	18	94	130,980
Missouri-Illinois	....	....	....	....	....	1	....	1	2	2,500
Missouri-Kansas-Texas	....	....	8	6	17	68	....	20	119	177,600
Missouri Pacific	....	....	6	22	14	154	24	75	295	408,200
Nashville, Chatt. & St. Louis	....	....	....	....	....	69	....	38	107	138,920
New York Central System	....	....	4	103	8	242	10	469	836	958,760
New York, Chicago & St. Louis	....	....	....	11	....	....	....	71	82	93,440
New York, New Haven & Hartford	....	....	....	87	30	62	....	159	338	430,620
New York, Ontario & Western	....	....	....	....	....	7	18	24	49	56,940
New York, Susquehanna & Western	....	....	....	....	....	....	....	22	22	20,380
Norfolk Southern	....	....	....	....	....	10	....	8	18	20,780
Northern Pacific	....	....	....	....	....	99	44	64	207	270,740
Northwestern Pacific	....	....	....	....	....	8	....	2	10	12,760
Pennsylvania	22	11	10	187	27	246	....	662	1,165	1,452,590
Pennsylvania-Reading Sea Shore Lines	....	....	....	....	....	6	....	...	6	9,000
Pittsburgh & Lake Erie	....	....	....	4	....	....	....	37	41	45,000
Pittsburgh & West Virginia	....	....	....	4	....	....	....	1	5	9,000
Reading	....	....	....	....	....	54	20	117	191	212,560
Richmond, Fredericksburg & Potomac	....	....	10	....	....	23	....	22	55	79,000
St. Louis-San Francisco	....	....	17	6	....	178	....	84	285	396,190
St. Louis Southwestern	....	....	....	3	....	15	20	36	74	92,300
Sacramento Northern	....	....	....	....	....	....	....	7	7	2,880
Seaboard Air Line	14	....	6	54	54	114	44	62	348	541,220
Southern Pacific (Pacific)	....	....	1	42	....	452	....	162	657	910,130
Southern System	....	....	....	35	14	324	70	174	617	842,900
Spokane International	....	....	....	....	....	....	....	9	9	9,000
Spokane, Portland & Seattle	....	....	....	1	....	42	....	25	68	89,320
Staten Island Rapid Transit	....	....	....	....	....	....	....	8	8	6,800
Tennessee Central	....	....	....	....	4	6	....	5	15	19,720
Texas & New Orleans	....	....	....	12	....	56	....	67	135	174,260
Texas & Pacific	....	....	....	10	....	64	....	24	98	140,800
Texas Mexican	....	....	....	....	....	4	....	14	18	16,120
Toledo, Peoria & Western	....	....	....	....	....	10	....	3	13	18,000
Union (Pittsburgh)	....	....	....	....	....	24	....	95	119	117,540
Union Pacific	....	....	....	65	....	287	....	199	551	764,480
Wabash	....	....	6	8	....	81	....	72	167	216,620
Western Maryland	....	....	....	....	....	31	....	23	54	66,560
Western Pacific	....	....	....	....	....	51	48	28	127	165,380
Total	36	11	119	**1,275	283	5,647	1,173	5,603	14,147	18,441,987

** Includes 34-1800 horsepower units.

Note: Since the number of Diesel-electric locomotive units in the above tabulation were based on A. A. R. statistics, only those units, received by the railroads from the builders, that were reported to the A. A. R. as installed in 1950, were included.

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Changes in 1951 Interchange Rules*

Part II

By T. J. Boring†

Rule 70

Section (g)—Modified to provide that road issuing defect card for cut journal must assume charge for difference in value between multiple-wear, as well as one-wear, wrought-steel wheels applied by intermediate road in place of serviceable cast-iron wheels standard to car. The same applies when multiple-wear are applied in place of one-wear wrought-steel wheels.

Rule 74

Second Paragraph—Modified to provide that cast-iron wheels, single plate, of 80,000 lb. capacity or over, are condemnable when flanges have flat vertical surface extending 7/8 in. or more from tread, or flanges 1 1/16 in. thick or less, gaged at point 3/8 in. above tread. The one-inch condemning limit or opening for flange thickness in Figs. No. 1 and 3 (pages 154 and 156) Wheel Defect gage has been increased to 1 1/16 in., and the 1 1/8-in. opening in the left half of Fig. No. 7 Remount gage on page 167 has been increased to 1 3/16 in. These changes, and the reduced flat vertical flange surface limit, provide closer limits and will condemn such cast-iron wheels sooner than heretofore. Corresponding changes are being made to the Limit Wear and Master Gages shown in the Association of American Railroads Manuals.

Rule 76

First and second paragraphs—Modified by changing reference to Fig. 4-E in first paragraph to relettered Fig. 4-F covering tread worn hollow cast wheels, and adding new Fig. 4-E to the second paragraph covering tread worn hollow (or high flange) wrought-steel wheels, this new Fig. 4-E being same as Fig. 128 of the Wheel and Axle Manual and still referred to in this Rule.

Rule 86

Third Note following table Standard Axles, Limits of Wear and Dimensions, New—Eliminated account table covering "Tubular Railway Axle for all Purposes-Limits of Wear and Dimensions, New" transferred from P. C. Rule 7 to this rule, as tubular axles are used mainly under freight equipment cars.

Rule 88

Third item, Wooden draft timbers in place of metal draft arms extending beyond bolster—Eliminated account obsolete.

Rule 91

Section (a)—Addition of new Paragraph—Billing repair cards returned for adjustment of exceptions should either be marked to indicate bill number of billing railroad and reference to date of bill in which charge was included, or the bill number should appear on correspondence in connection with exceptions taken.

Interpretation No. 5—Modified to provide increased time limit for the handling of exceptions taken by car owner to repair charges.

Rule 94

Second paragraph—Modified to clarify the intent relating to basis for computing depreciated value less salvage of damaged cars dismantled instead of repaired, under provisions of this rule, on authority of defect cards.

Rule 95

Second paragraph—Modified to clarify the intent that *any type* of follower is intended when lost with draft gear, being the same responsibility.

Rule 101

Material Charges—Price adjustments have been made in line with recent quotations resulting in most items being somewhat increased. A resume of 48 of the items most often used in repairs, shows that present prices have increased six per cent which is an increase of 90 per cent over January 1, 1946, prices. All prices included seven per cent Stores expense, one per cent interest on stock investment and approximately one per cent for commercial and deadhead freight haul. The following principal changes have been made in this rule:

Items 46 and 47, Notes—Modified to provide that where service and emergency portions of AB brakes are renewed on authority of defect card account *damaged by fire*, they must be returned to the manufacturer to be r e-conditioned to justify charges under these Notes (55 per cent value new plus COT&S charge). Otherwise, charge must be confined to COT&S only. Therefore, it will be necessary to follow these fire damaged AB service and emergency portions through the air brake shop to establish basis for charges on defect card.

Items 99, Note preceding—Modified to eliminate the exception to full charge for extra heavy pipe fittings applied to hand rails on tank cars. *New Item 100-A*—Added to provide charge for Flextite Split Sealing Gaskets (To be used in reinforced flange fittings only).

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* Abstract of a discussion of the changes in Interchange Rules presented at a meeting of the Eastern Car Foremen's Association, New York, February 9, 1951.

† General foreman, M.C.B., Clearing House, Pennsylvania.

TABLE I

Year	Forgings	M. I.	C. S.	Type H Springs	Chain	Lumber	5/8 in. or over Rivets	Freight Labor
1895	0.03	0.03	0.05	0.035	0.05	0.025	0.10	0.20
1920	0.05	0.08	0.09	0.05	0.05	0.045	0.16	0.67*
1930	0.06	0.11	0.09	0.045	0.075	0.075	0.22	1.10
1941	0.065	0.075	0.10	0.055	0.08	0.06	0.22	1.40
1948	0.10	0.15	0.15	0.085	0.13	0.13	0.34	2.25
1950	0.11	0.185	0.175	0.095	0.155	0.13	0.42	2.80
1951	0.10	0.20	0.17	0.095	0.16	0.155	0.42	2.80

10 per cent added to net total bills for 1913.
* 30 per cent added to net total bills for 1919 and 1920.
Scrap credit per lb.—In the early years this varied from ½ to 1 cent for different materials, and since 1913 has been ½ cent for all materials except for brass and journal bearings.

TABLE II

Labor, Per Hour	August 1929	January, 1938	December 1941	February 1944	June 1946	September 1947	September 1949
Freight	1.10	1.25	1.40	1.60	1.95	2.25	2.80
Passenger	1.20	1.40	1.55	1.75	2.15	2.50	3.10
Tank	1.25	1.45	1.60	1.85	2.25	2.60	3.20
Lubrication and Cleaning	0.85	1.00	1.10	1.25	1.55	1.80	2.25

Items 107-C and 107-D—Modified to indicate that charge for complete geared hand brake or housing assembly includes upper chain. Billing repair cards, covering renewal of these parts need not show upper chain separately as was done in the past.

Item 132, Charges and Credits for D coupler parts—Table of average charges and credits for secondhand, reclaimed and defective parts eliminated and is placed on basis similar to *E* coupler parts, in conjunction with change made in Rule 104-a-2. Hereafter condition of each part removed must be shown on repair records same as is done with *E* coupler parts.

Item 172—Modified by omitting reference to side bearings in view of eliminating requirement in Rule 61-c on side bearings when lubricating center plates.

Item 213, Note 5—Modified to provide permanent basis for charge and credit for hangerless type brake beam other than the A.A.R. Standard No. 18 beam when renewed in kind, and lesser charge when substituted for A.A.R. No. 18 hangerless beam.

New Item 219—Added to provide for welded head and truss type of A.A.R. Standard No. 18 brake beam, Certificate No. 53, same also added to Fig. 2 Indentification table on page 213.

New Item 250—Added to Section I to provide charge for American Steel Foundries Quad draft gear which has been conditionally approved.

New Note 4—Added to Section I indicating 500 sets of Waughmat Twin Cushion Type WM-4-6 R draft gears have been authorized for experimental service. The *R* signifies used with rigid shank coupler versus swivel shank coupler used with their WM-4-6 gear which has been conditionally approved for unlimited application per Note 3.

Fig. 2, Brake Beams, page 213—Additional design of A.A.R. Standard brake beam added to cover Certificate No. 53 type.

A.A.R. Approved Equivalent Retainers, and Locks (Page 218)—"Twin-Lox" Draft Key Retainer is added, made by Western Railway Equipment Company.

A.A.R. Approved Types of Geared Hank Brake (Page 219)—Ajax No. 14370 and Union Asbestos and Rubber Co. No. 3750 have been added to table of *Vertical Wheel Type.*

A.A.R. Approved Types of Journal Box Lids (Page 220)—American Locomotive Company's "Alcolid" No. 560 and Union Spring & Manufacturing Company's No. 927 added to 5 by 9 5½ by 10 sizes; Gunite Foundries Corporation No. 493, Motor Wheel Corporation Nos. 171 and 173 added to 6 x 11 size list.

List of Approved Packing Retainer Devices (Page 221)—Added showing nine Spring Types and three Package Types.

General—This Rule has grown from 13 items in year 1885 to nearly 300 items plus tables of weights, sizes, etc., with combinations. The prices were rather frozen during the recent war, considerably increased since, mostly due to the large increase in labor costs. Similar occurred after World War I. Table I shows the changes in the principal items at seven stages since the year 1895.

Rule 104

Sections (a-1), (a-2), (a-3) and Interpretations No. 2 and No. 3—Modified account elimination of columns, "Charge Secondhand or Reclaimed" and "Average Credit (Secondhand, Defective or Missing)," opposite Items 132 to 132-E of Rule 101 Covering *D.* coupler parts and restoring these items to a regular charge and credit basis, similar to *E* coupler parts.

Rule 107

Labor Charges, Item 134 and 135—Modified to indicate that these items now include metal as well as good screws used in securing car parts. Table II shows the increases since the year 1929.

Rule 111

Air Brake Repairs, Items 15 and 15-A—Prices covering periodic cleaning of AB and AB-1-B air brakes are increased due to additional expense incurred in repairs and renewal of service portion back covers and 100 per cent renewal of emergency portion ball check covers, plus increased cost of other material.

Rule 112

Settlement for Destroyed and Badly Damaged Cars—Section B-1, New Fourth Note—Added to provide basis for settlement for caboose cars damaged or destroyed off home road.

Section J—Modified to include journal roller bearing assemblies as additional material which car owner may request return of under provisions of this rule.

PASSENGER CAR RULES

Rule 2

The effective dates of the following Sections have been extended to January 1, 1952:

Section (e)—Cardboards or suitable receptacles for Defect Cards and Joint Evidence Cards.

Section (f)—Brake shoe spark shields.

Rule 7

Section (c), Third paragraph—Incandescent fluorescent tubes or bulbs added as owners defects and eliminated from Rule 13. Labor charges provided by new Items 2 and 2-A added to P. C. Rule 21.

New Section (j-2) and Note—Added to provide that "When stenciling indicates air brakes are due for cleaning within 30 days, brakes may be cleaned regardless of whether or not car requires other repairs." This is to avoid rejection and setting out of loaded cars enroute due to old air date.

The New Note is to indicate that "all work should be properly performed as required by the applicable air brake instruction pamphlets."

Section (L-1 & 2)—Modified to provide that separate billing repair card is optional for periodic repacking of friction journal boxes and periodic lubrication of journal roller bearings to correspond with Freight Rule 9.

Paragraph (2)—Further modified to extend time limit to 90 days for grease lubrication types of journal roller bearings versus 30 days for oil lubricated types.

New Second Note—Added to table covering A.A.R. 1940-Design Passenger Car Axles Having Increased Diameter Wheel Seats, stating that table covering Alternate Standard tubular axle transferred to Freight Rule 86.

Rule 9

Section (g-2)—Fuel for internal combustion engines furnished at intermediate terminals added as a Line Service expense item.

Rule 13

Section (a)—Second item, Arch bars, straightened on car—Eliminated account obsolete.

Eighteenth item, Incandescent bulbs, applied—Eliminated account addition of new Items 2 and 2-A to Rule 21 permitting charge versus car owner for the application of incandescent and fluorescent types of bulbs and tubes used for electric lighting.

Rule 21

Labor Charges, New Items 2 and 2-A—Added as mentioned above.

Items 16, 20-C, 20-E, 20-F, 20-G, 20-H, 20-K and 20-M—Modified to provide increased labor and material allowances for the air brake work specified in each respective item, based on recent item studies by the A.A.R.

New Item 20-N—Added to provide charge for cleaning and repairing conductors valve which is chargeable to owner whether in connection with periodic attention to air brakes or separately.

Rule 22

Material charges—Adjusted in line with recent quotations resulting in considerable increase on most items. Where Stores Department cost is furnished, show the price, account and reference numbers on Repair Card.

Handling Prefabricated Freight-Car Sides

Assembly-line methods are not new in the construction of railroad box cars, but the Union Pacific recently inaugurated a materials-handling procedure which is greatly expediting the process. As a part of its current program to acquire 8,500 freight cars at a cost of $50,000,000

Fig. 1—How Youngstown steel box-car sides are received at Omaha shops, loaded in gondolas

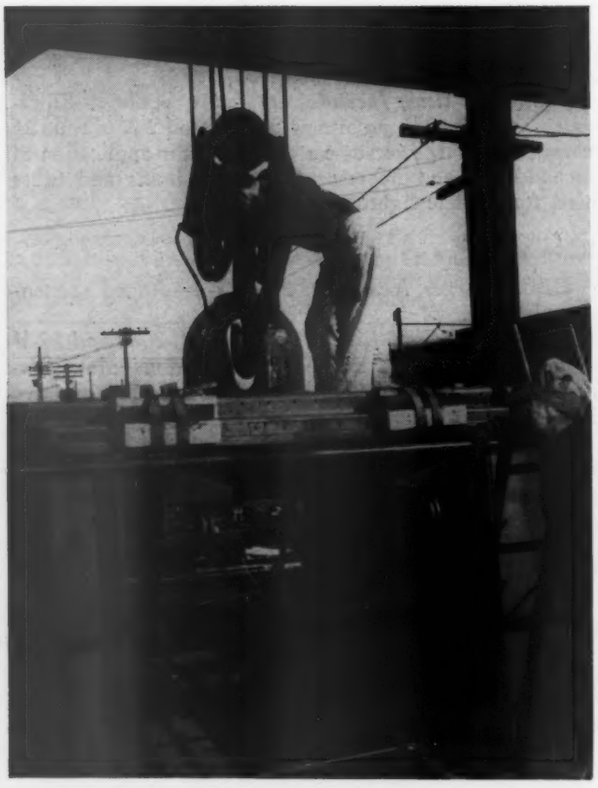


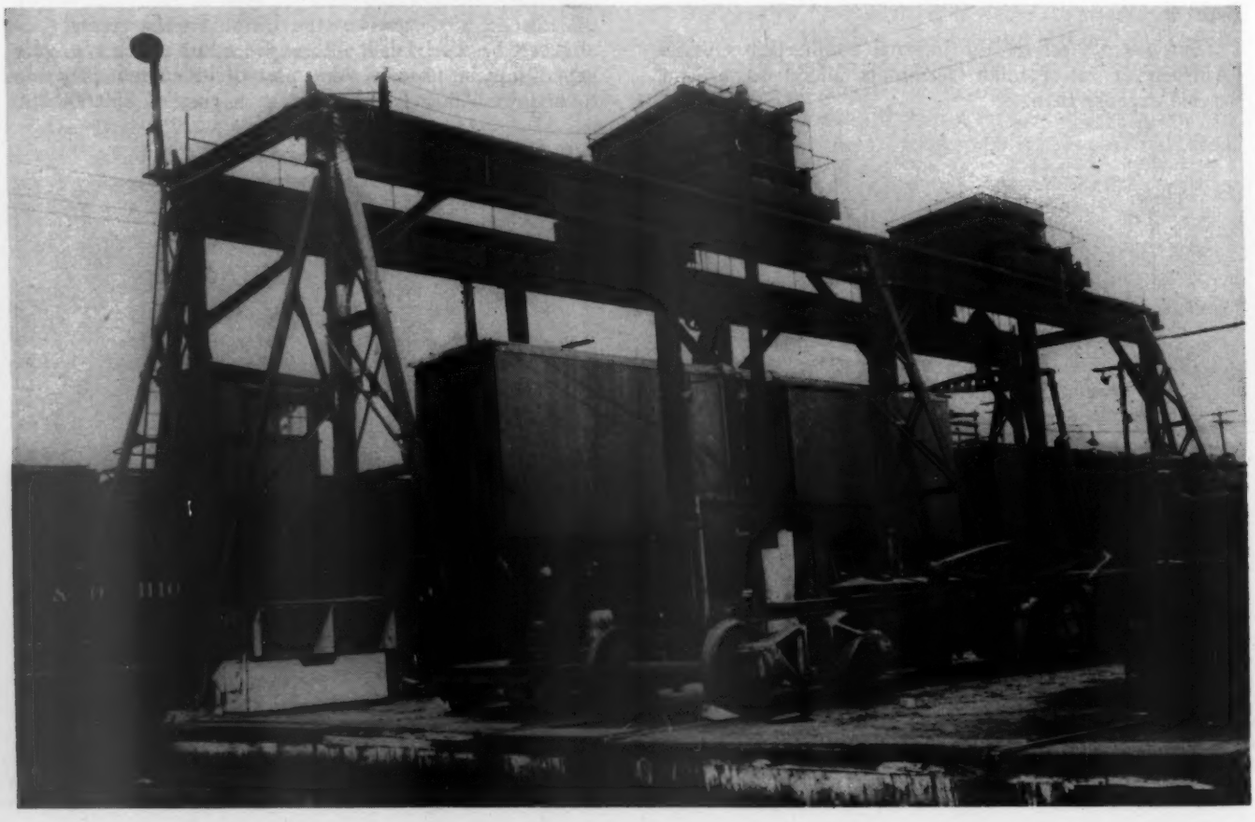
Fig. 2—Crane attachment used in unloading car sides from gondola in a single lift

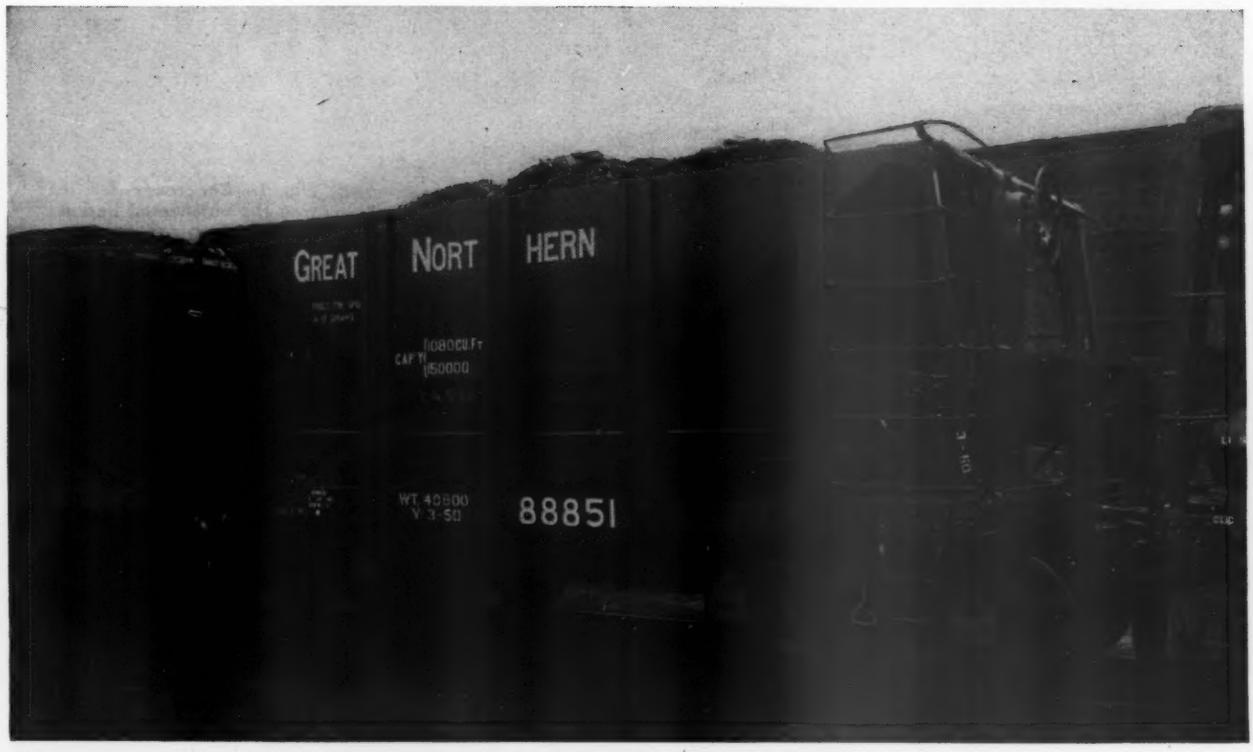
Fig. 3—Gantry crane transferring seven sets of car sides from gondola to truck-mounted underframe

the Union Pacific is building 1,000 box cars at the company shops, Omaha, Neb. Since car sides were arriving faster than other parts, necessitating double handling in unloading to stock piles and then moving to the construction track, the railroad worked out a unique system for eliminating ground storage.

Fig. 1 shows how gondola cars from the Youngstown Steel Door Company, Youngstown, Ohio, are each loaded with seven sets of box-car sides. The car is moved under a gantry crane flanked by a timber platform, and tie rods at the ends of the sides and tie bands through the doorways are cut away. A crane attachment is rolled through the doorway area of the sides and Fig. 2 shows how the crane hook is lowered to catch the eye of the attachment, which is raised midway between the sets of sides. Fig. 3 is an over-all view of the crane, showing the car sides suspended in the air. The gondola car, moved from under the load to the left, is free to go back into immediate service. Barely discernible under the suspended sides is an underframe, equipped with couplers and safety appliances, on trucks ready to accept the load. At the right, a second load of sides is waiting to move under the crane.

The car sides are thus carried on a long string of underframes with the sides cross braced at the ends and banded at doorways as in the original loads. When needed the loads are moved to the erection track where the sides are transferred to cars under construction. The Union Pacific is also building 500 40-ton livestock cars and 500 70-ton covered hopper cars and has completed 2,500 box cars and 500 livestock cars in its own shops. Five hundred flat cars are being built by the Union Pacific at Denver, and builders are constructing 1,000 gondola and 1,000 box cars and have already completed 1,000 gondola cars.





A rehabilitated car. Side stakes were reused by plug welding to new sheets

How Ore Cars Were Reconditioned by Welding*

THE Great Northern has a fleet of 7,200 drop-bottom hopper cars assigned to iron ore service. These cars are of all-steel construction, 24 ft. long, with capacities of 75 tons and 1,200 cu. ft.

All repair work and reconditioning must be done in the winter in order that the maximum number of cars will be in serviceable condition during the 7- to 8-month ore season. Just before the close of the ore season, a thorough inspection is made of all ore cars and they are classified as to the type of repair required. Light repair work is done at the Allouez repair yard, and the heavy repair and rebuilding at the Superior steel shops. The cars were originally purchased from a car builder and for the most part are of riveted construction.

Last year it was decided that 400 of the older cars built in 1920-24 were to be reconditioned, and instead of the riveted type construction, an all-welded type construction would be used for new baskets or hoppers. The reason for this change was that a saving could be made in labor and material. For instance, by making new baskets by welding, 400 5/8-in. rivets per car would be eliminated. The baskets would be more efficient, too. Welded construction of the basket would eliminate ore sticking to rivet heads, and cars would empty more easily and competely.

The old baskets were stripped from the underframes, then the underframes and trucks were repaired outside the shop. All of the new basket prefabrication and assembly work was done inside the shop, which measures 108 by 240 ft. Crane facilities in the shop are not unusual and other equipment consists of a press brake, used to form end and side slope sheets, a gang punch shears, stationary and portable flame-cutting machines, three automatic submerged melt welding heads, three flexible welders of the submerged type, and ten electric welding machines. More of the latter are brought in as needed.

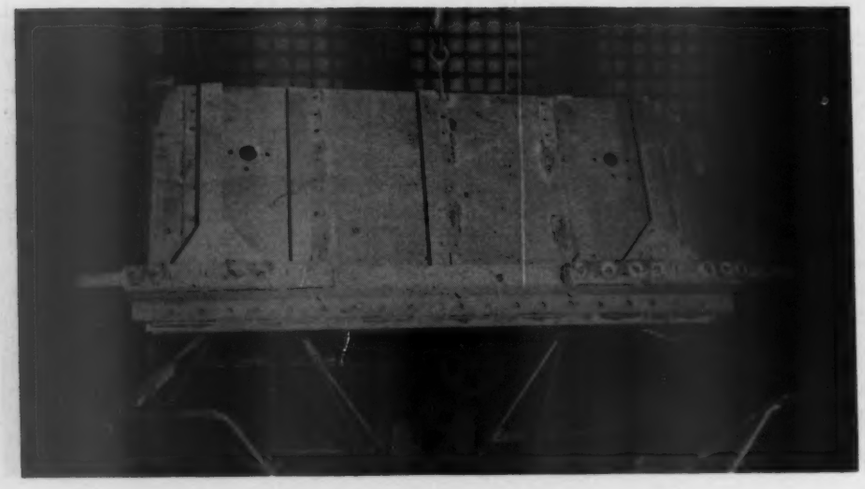
Each car received a complete new welded hopper or what we call a basket. Trucks and underframes were in good condition and in practically all cases it was cheaper to repair them than to buy new equipment. By utilizing various jigs and devices, and assembly-line methods, eight cars per eight-hour day were reconditioned and ready for service. Most of the illustrations for this paper show the repairs on an order of 70 ore cars. This repair work varied slightly from the repairs made to 330 cars done earlier.

Fig. 1 shows a car ready for removal of the old riveted basket. All rivets were removed by flame-cutting. Side

* Abstract of an address delivered before the American Welding Society by J. F. Likarish, master car builder, Great Northern

← Fig. 1—Car ready for removing the old riveted basket. The two large triangular holes near the top of the side were flame-cut to facilitate lifting the basket with an overhead crane

Fig. 2—Repaired underframes heading into the shop for application of new baskets →



← Fig. 3—Hopper bottom door reconditioned by intermittent hand-arc fillet welds with plug welding

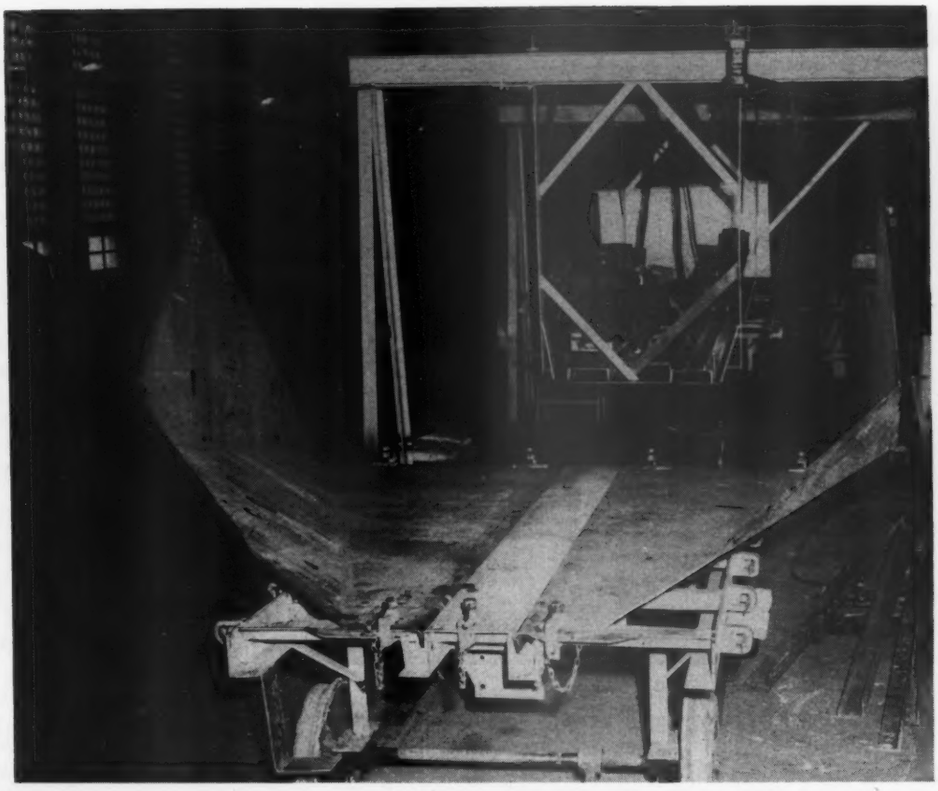


Fig. 4—How the end slope sheet is assembled preparatory to joining by the submerged welding heads in the background ➔

➔ Welding a stiffener angle to the nearly completed end slope sheet

➔ The nearly completed basket being removed from its jig

▼ Two basket jigs are used for positioning, and two are used at the welding stations

Welding the new side stakes to the side slope sheets by manual arc welding

and end top angles have been removed. These will be straightened and welded to any car of this type which is going through the reconditioning. Holes are flame-cut near the top of the basket by which an overhead crane with a four-hook sling lifts out the basket. Steam hole or poke hole covers are removed and re-used on new baskets.

Fig. 2 shows three repaired underframes headed into the shop door. Just inside the shop the new basket will be lowered into place to start the re-assembly. The couplers and draft gears have been removed and after close inspection they will be repaired or replaced by new units if found to be defective.

Sub-Assembly Fabrication

The next steps described will be in the fabrication of sub-assemblies for the new all-welded baskets. An automatic flame-cutting machine used in this program cuts eleven sheets of copper-bearing mild steel ¼ in. by 104 in. by 120-in. at the rate of 7½ in. per min. A No. 8 cutting nozzle is used. Oxgyen pressure is 42 psi.; acetylene, 3 psi. The operator uses a crowbar to force the sheets together as the cut progresses. Strong backs used to clamp the plates have built-in slots into which the crowbar fits easily. One operator using this machine cuts eight sets of car end and side sheets in eight hours.

Fig. 3 shows a reconditioned hopper bottom door. A Z-bar support from an old door is welded to the new door plate that is cut to size and pressed-formed. Old Z-bars were straightened in a shop-made press at a special station equipped for that work. In the 330-car order, the construction of the door made it possible to use semiautomatic submerged melt plug welds between the reinforcements and the door sheets. There were 41 plug welds per door. In door repairs as shown here, intermittent hand-arc fillet welds were used in the construction with some plug welding.

Fig. 9 shows the station where new side stakes were welded to side slope sheets by manual arc welding. A 500-amp. machine with a 3/16-in. coated rod was used for this operation.

In assembling parts of end slope sheets, a small formed channel at the center of the jig is welded to the two large sheets. The top angle is also a part of this assembly. Hinged C-clamps hold the parts on this rolling jig, and six telescope bars can be wedged to hold the sheets together during welding.

Fig. 4 illustrates the end slope sheet jig and shows how the end slope sheet is assembled, ready to roll under the submerged-arc welding heads in the background. Four of these portable jigs are used.

The flange joint to be welded between the end and channel or middle section of the slope sheet is filled in with a ¼-in. soft steel rod tack welded at one end into the base of the root flange-weld that is made by submerged melt welding. A small concave wheel rides on the rod, guides the machine and, at the same time, holds the rod down in the groove. The purpose of this soft steel rod is to shorten the welding time.

Two U-type welding heads simultaneously make the root flange welds in the end slope sheets. Each weld is 9 ft. long and made at 14 in. per minute; a.c. voltage is used. The current is 650 amp., and the rod is 3/16 in., Type No. 36. The melt is designated as No. 80, 20 by 200 mesh. A jig cart positions the part under the welding head.

Fig. 6 shows the nearly completed end slope sheet to which one of two stiffener angles is being arc welded. Note the top end angle in place. This particular type of end angle construction made it necessary to fillet weld the angle to the sheet by the hand-arc method. The construction of the cars in the 330-car order made it possible to use automatic welding of the end top angle without removal of the assembly from this jig. This was done by swinging a track and welding head over the assembly in this welding line.

Final Assembly Operations

A carman is positioning one of the side slope sheets in the basket jig shown in Fig. 7. Four of these jigs were used in this program. While two are used for positioning, the other two are used at the welding stations. Note the side stake on the near edge of the side slope. The end slope sheet will be placed in the jig at the end nearest the camera. The side stake will overlap the butt joint of the side slope sheets.

When the dollies are removed from each end of the jig in Fig. 7 it can be turned 360 deg. and held in four different welding positions. A flexible semiautomatic welding head is used for the welding.

A flexible welder is employed to make intermittent welds between the top angle and the side and end slope sheets. Current is 350 amp., 30 volts, while the rod is 3/32 in. Speed is 12 to 14 in. per min., with full penetration. The flexible welder also makes the butt weld between end and side slope sheets. This welding method was also used to make two plug welds at the top of the side sheets, the weld going through to the side stakes, makes a total of eight plug welds per car.

A copper back-up bar is used on the outside of the basket at the butt joint between the end and the side slope sheets below the side stakes.

In the 330-car order previously mentioned it was possible to use the old car side stakes on new baskets. In preparation for their re-use, rivets were removed by flame-cutting and through the rivet holes plug welds were made to the sheets at the welding station shown here. An elevator device is used to bring the rod and melt feed machine to the level to make this plug weld possible. At

this station also, the butt-welding inside the basket was done with the welding machine at the lower position. In other words, the welder was used at the upper position for plug welds and at the lower for butt welding. There were 106 plug welds per car on the 330-car order just mentioned. As shown in a previous photo, side stakes were manually arc welded in the 70-car order, pictures of which are shown in this paper. Fig. 8 shows the almost completed basket being lifted from one of the jigs. It will be moved by crane down the shop and placed in a reconditioned underframe.

A view of the inside finished basket would show the few rivets used in these rebuilt cars—on the corner angles, safety appliances and doors. While rivets are not desirable in the doors, they were used because the hinges were malleable iron and in too good a condition to scrap.

Following the assembly of the basket to the underframe the air line pipes were renewed, the hand brankes were reconditioned and tested, and the door closing mechanisms were installed and tested.

Fig. 1 is a completed rehabilitated car. You will immediately notice the construction differences between this and the one first shown. The car here is one of the 330-car order in which the side stakes were re-used by plug welds to the new side sheets. In this type of car the top angle is on the inside of the slope sheets.

Welded construction of the new baskets has given a car that will provide service equal to that of a new car. The rehabilitation has resulted in a substantial saving to the Great Northern.

Reclaiming Car Couplers

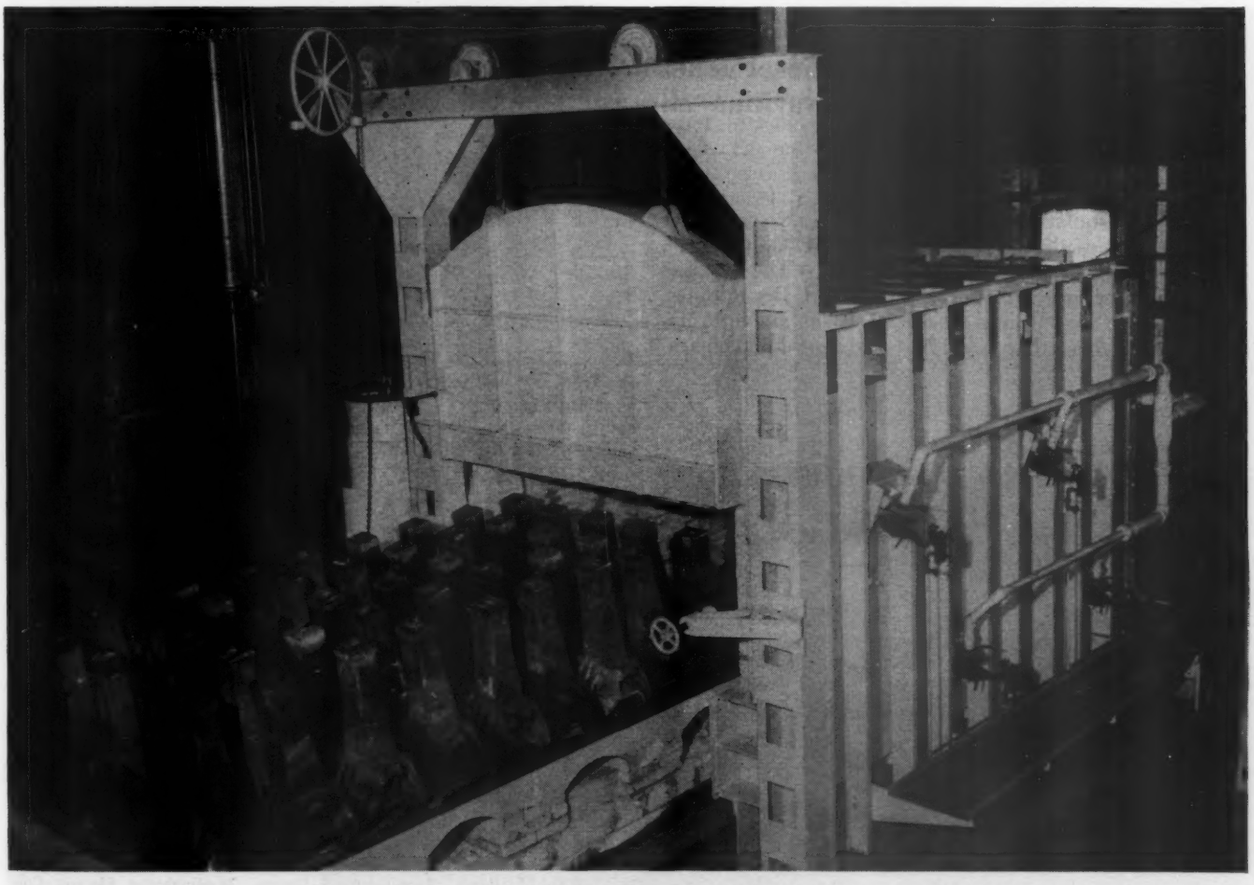
More than 300 damaged cast steel car couplers averaging 280 lb. each are being reclaimed each month by the Erie at Meadville, Pa., and put back into service conserving 87,000 lb. of metal, through a new welding and normalizing process undertaken after exhaustive research and tests. The process has been approved by the A. A. R. Mechanical Division.

After welding, the couplers are normalized in a new automatic heat-controlled furnace, which makes the reclaimed material suitable for continued use. The furnace is of the car type 6 ft. 6 in. wide by 12 ft. long, with a door 3 ft. 6 in. high and heated by 8 oil burners.

Forty-five welded couplers stand vertically on the floor and fill the oven. A low heat is applied and brought up gradually to 1,600 deg. F. taking two hours to reach that temperature. A pyrometer holds the heat at 1,500-1,600 degrees for one hour 45 min., before it is shut off and the couplers drawn and allowed to cool in still air free from drafts, snow or rain.

Normalizing couplers relieves heat stresses, corrects fatigue and crystallization and gives them new life so that they stand as rigid tests as new units. Processed couplers are applied to foreign cars in routine manner.

Erie car inspectors find about 370 damaged units monthly and send them to the Meadville plant for reclamation. After examination about 80 per cent are saved, welded and normalized, and the others scrapped or converted to other uses.



The second step in the Erie's reclamation of car couplers. After being built up by welding, the couplers are placed 45 at a time in the furnace for annealing at 1,500-1,600 degrees for 1¾ hr.

ELECTRICAL SECTION

Fig. 1—A general view of the Northfield car showing the packaged diesel-driven, a.c. power plant (see Fig. 5) and the condenser and radiator package unit (See Fig. 2)

A. C. Power Plants for Passenger Cars

Westinghouse undercar diesel generating plant with twin sealed compressors to be tried out under various climatic conditions by the Rock Island

*By H. H. Hanft and I. S. Ritter**

A TRIAL installation of Westinghouse a.c. passenger car power was made late in 1948 on the car "Northfield", of the Chicago, Rock Island and Pacific. The car was first put in service between Chicago and Des Moines, Iowa, on the "Des Moines Rocket". To obtain information on a north-south run, with its extremes in temperature, the car was transferred to the "Twin Star Rocket" running between Minneapolis, Minn., and Houston, Tex., in February 1949. It remained in this service regularly until November 1949, when it went into its present run between Denver, Colo. and Chicago on the "Rocky Mountain Rocket".

Fig. 2—A close-up of the condenser and radiator package unit

The Power-Plant Package

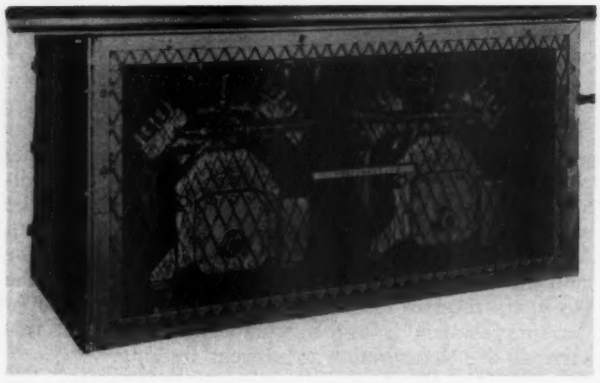
The power-plant package, resiliently mounted under the car, includes a diesel engine and an alternator. The complete removable power plant weighs 3,000 lb. The engine used is a Type DJXHF Hercules diesel engine. This is a horizontal engine specially developed to meet the exacting clearances required on undercar railroad equipment. It is a 6-cylinder unit with 209 cu. in. displacement and a rating of 79 hp. at 1,800 r.p.m. at sea-level altitude and normal temperature. When the engine is derated for altitude and temperature, the engine is rated at a little more than 2 hp. per kw. of generator rating. Opera-

* H. H. Hanft, Transportation Section, Westinghouse Electric Corporation, East Pittsburgh, Pa., and I. S. Ritter, Sturtevant Division, Westinghouse Electric Corporation, Hyde Park, Mass.

Fig. 3—A view of the other side of the Northfield car shows the hermetically sealed air-conditioning compressor mounted underneath (see Fig. 4)

tion of the engine at light loading tends to reduce maintenance requirements and costs, and still keeps the engine in a loading range for economical operation.

Coupled directly to the engine is a Westinghouse 3-phase alternator. It delivers 30 kva. at 0.8 power factor, 220 volts and 60 cycles. The excitation system has no moving parts, which saves a great deal on service work and gives regulation. The rotating main field is excited through the car emergency-lighting battery. The second or auxiliary field is excited to maintain constant voltage at varying generator loads. It is connected across a selenium rectifier that is served by three current transformers in the main-generator leads. Any increase in generator load increases current in the rectifier thus increasing the field current to maintain a constant voltage. Response to load changes is extremely rapid, as no inertia of moving parts is involved. Close regulation is obtained.



The engine and alternator are packaged so that all routine servicing of the engine can be accomplished without moving it. Lubricating-oil filters, fuel filters, air cleaner, lubricating-oil drains, and filler pipe are all located at the front of the unit. When necessary for other servicing or to replace the power plant with a spare, the entire unit is rolled out on slide rails after disconnecting sealed water and fuel couplings and electrical plugs. Removal and replacement of a power plant has been accomplished in five minutes.

To furnish the engine with as clean combustion air as possible, 250 cu. ft. per min. of conditioned air is drawn

Fig. 4—(above) A close-up of the hermetically sealed air-conditioning compressor, also a packaged unit

Fig. 5 — The packaged diesel-driven, a.c. power plant rolled out on slide rails for inspection

from within the car. This air first passes through the generator and then divides. Part goes to the engine air intake through its air filter. The remainder spills into the power-plant package, building up a slight pressure which helps keep dirt out. This clean air serves to reduce maintenance and insures against engine damage should the engine air filter not be properly maintained.

To facilitate starting in cold weather a loop is connected to the train steam line and run through the power-plant package. When out door temperature drops to 40 deg. F. and the engine is shut down, steam is supplied to the loop keeping the engine warm.

During a typical period, which covers both winter and summer operation, the average loading of the unit was 13.7 hw.-hr. The fuel consumption was 6.73 kw.-hr. per gal. of fuel oil and 72.8 kw.-hr. per quart of lubricating oil.

Air-Conditioning System

The air-conditioning system is designed to use two standard Westinghouse hermetically-sealed compressors. Each compressor is driven by a 5-hp., 3-phase, 60-cycle, 220-volt, 1,750-r.p.m. motor built integrally with the compressor. Freon-12 refrigerant vapor passes over the motor windings to cool the motor. The compressors are connected to two entirely separate systems and have a total cooling capacity of from 8 to 9 tons.

The outstanding advantage of the two separate systems over the single-compressor system is the fact that one system can ordinarily carry the car load. The second unit is required on only a few high-temperature days, or in case of a break-down of one compressor or should a leak develop in one system. In the single-compressor system, a failure of this type would mean a hot car for the remainder of the run, which might be as much as 60 hours.

For ease in servicing—a matter of great importance in railroad service—each compressor is also mounted in a package on movable slides. Lines to each are sealed by a set of valves while the compressor itself is sealed by another set. Closing these valves and unbolting two flanges allows the compressor to be removed and another fully charged one slid into its place. The compressor-package, like the engine-generator package, is an under-car installation.

The method of controlling the air-conditioning system provides the railroad passenger with exceptional comfort. The essential difference is the removal of moisture from the car air when the outdoor temperature range is between 60 and 75 deg. F. and then reheating it to the desired car temperature. One compressor system is controlled only by outdoor temperature and operates continuously when the temperature is 60 deg. F. or above. At this point, car cooling is not needed but the evaporator removes moisture from the air as well as cooling it. This moisture is removed in sufficient quantity to insure a satisfactory effective temperature without dependence on a humidistat. Humidistats in general are erratic. After some moisture has been removed, the air is reheated electrically to maintain the car temperature at 75 deg. F.

The second compressor and its system is controlled only by the temperature within the car. It operates only when the first system is not able to keep the car down to 75 deg. F. or at any time when the car temperature is above its 75-deg. F. setting. In this manner, car conditions of 75 deg. F. and below 55 per cent relative humidity are maintained under all warm-weather conditions.

Future installations of this system will provide for the use of the engine waste heat in heating the car, thus making the car completely independent of the locomotive for heating, cooling, and power. This was purposely not done with this experimental installation to simplify the gathering of performance data. With this additional utilization of equipment, part of the 55 to 65 per cent loss in heat energy from the fuel will be utilized, making an extremely efficient system. It is expected that when complete trains are equipped with this system that operation in multiple will be desired.

The Air-Conditioning Condenser

The condenser is air cooled, aided by atomizing sprays of water controlled by discharge pressure. The condenser can carry an 8-ton load, without any water, until the outdoor temperature exceeds 90 deg. F. If the temperature is above 90 deg. F., the discharge from the compressor in service rises sufficiently to bring the sprays into operation. Each compressor has its own condensing coil and sub-cooling coil. The condensing coils and sub-cooling coils are built into one assembly and receive their cooling air from one Axi-Flow fan. Liquid receivers for the two systems are also mounted on the package.

To save duplication in parts such as motor, fan, and casing, the engine radiator coil is mounted in front of the condenser coil as part of the condenser package, using the condenser fan and housing. This method also insures that a separate radiator cannot be located under the car so as to blow hot air over the condenser coil, which would reduce its capacity.

The mounting of the radiator coil to the condenser poses a problem in winter. It is necessary to operate the fan at all times for engine cooling, but during the winter with the condenser not operating, snow could block the condenser coil and prevent air from reaching the radiator. By automatically reversing the rotation of the motor-driven fan, when the outdoor temperature drops to 40 deg., the air is then brought in through the hot radiator coil, which insures against coil blockage. At 60 deg. the fan again reverses to its normal rotation. Any water in the spray system is also automatically dumped at this same 40-deg. temperature to prevent freezing.

The Air-Conditioning Evaporator

The system evaporator is an overhead type located in the roof of the car. The evaporator is made up as a packaged unit, which includes its two separate system coils, a fan section, an emergency steam coil and a bank of electric strip heaters for use on reheat and car heating. Two single-inlet Multivane fans supply air to the evaporator. The air is made up of 1,600 cu, ft. per min. of recirculated air and 800 cu. ft. per min. of outdoor air. The evaporator coil for each system covers the full face of the package so that all air must pass over a refrigerated surface, even with one compressor shut down. On the leaving end of the evaporator is mounted an 18-kw. bank of electric strip heaters that are used to reheat air leaving the evaporator after dehumidification and for car heating in cold weather.

The Control System

A novel and effective method is used in controlling the overhead bank of electric heaters. Three 7½-kva. saturable-core reactors control the power input to the heaters. The a.c. coil of each reactor is placed in a leg of the 3-phase circuit. The current in the heater circuit is then

(Continued on page 81)

General view of interior of original building now devoted to mileage overhaul and assembly of motors and generators

The Southern's Diesel Electrical Repair Shop

An explanation of the requirements of a diesel locomotive electric shop and a description of the facilities installed to meet those requirements

Part I

By R. H. Herman *

COMPLETE new facilities for the repair and overhaul of diesel-electric locomotive traction motors main generators and auxiliary generators were placed in service at the Southern's Pegram Shop, Atlanta, Ga., in 1944. Since that time, additional tools and equipment have been purchased and the shop expanded until it now occupies over twice as much floor space as in the original layout. This expansion was essential to take care of the increased volume of work as additional diesel-electric locomotives were placed in service on the system lines.

The shop in its present state represents a large amount of preliminary work in both planning and estimating cost and operating data, as well as visits to the relatively few repair shops which were in operation at that time for repair and overhaul of diesel-electric locomotive traction motor and generator equipment. Subsequent developments

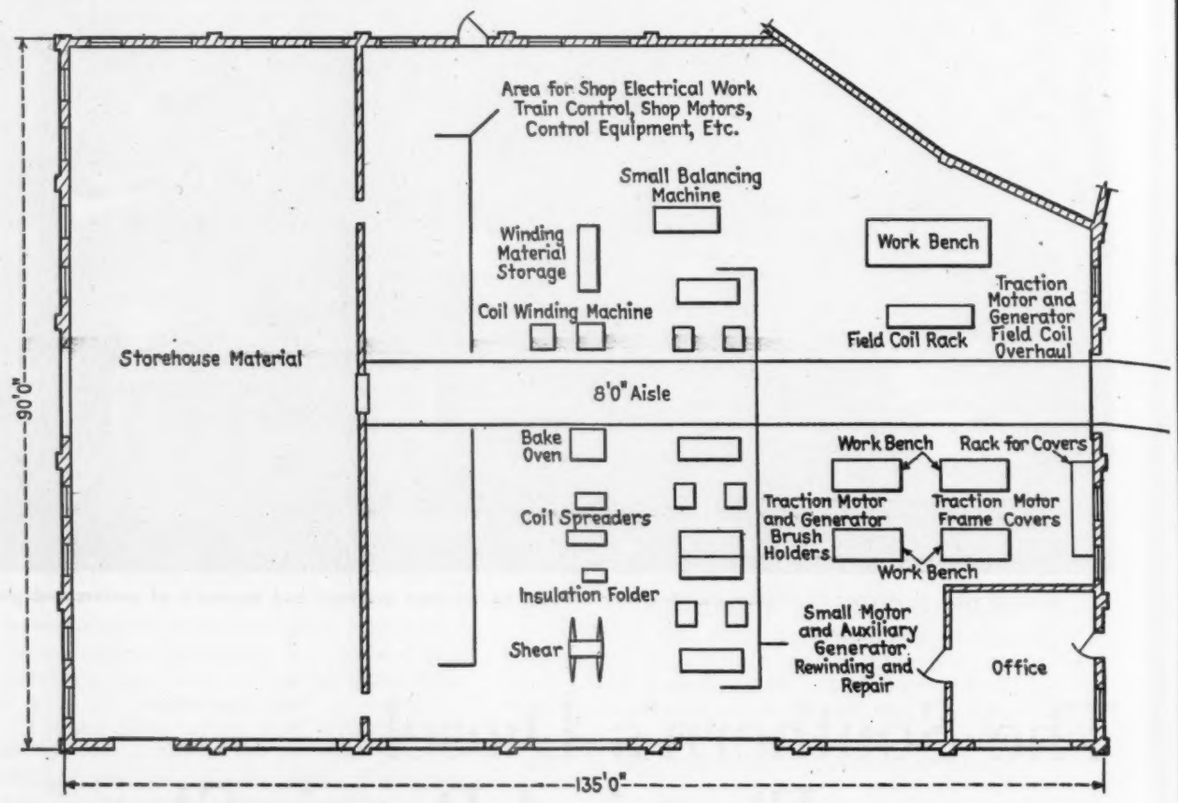
* Engineer, Shops and Equipment, Southern Railway System, Washington, D. C.

have proven the value of the preliminary studies, since it has been relatively easy to expand the facilities as necessary for the increasing volume of work. The following data illustrates the manner in which maintenance requirements have grown, and the steps which were taken to satisfactorily handle the requirements. As such it should provide a guide in planning similar facilities on railroads anticipating large scale dieselization in the future.

The first diesel-electric locomotives on the Southern were six diesel-electric rail cars which were purchased and placed in service late in 1939. A short time later, the diesel-electric freight locomotive was introduced by Electro-Motive Division of General Motors Corporation, and trial operation of this equipment during the latter part of 1940 soon resulted in orders being placed for a number of freight units, followed by orders for passenger and switcher locomotives.

In January, 1942, the locomotives in service comprised the six rail cars mentioned above, fifteen 2,000-hp. passenger units, eight 1,350-hp. freight units and thirty-three 600- or 1,000-hp. switchers, making a total of 62 units. In addition, there were sixteen 1,350-hp. freight units and one 1,000-hp. switcher on order for a total of 79 units. Indications were that additional diesel-electric locomotives would be purchased as financial conditions permitted. However, it was inconceivable that in a short space of ten years they might replace practically all existing steam locomotive units and become the basic motive power for freight, passenger and switching service.

Traction motors and generators on the first locomotives which failed within the warranty period, or were removed for mileage overhaul, were returned to the manufacturer in the case of Electro-Motive Division, or overhauled by local service shops of the General Electric Company and Westinghouse Electric Corporation. The manufacturers' repair procedure at that time was primarily on a unit exchange basis, and there was some concern over the sending out of relatively new motors and receiving in return older motors which might have considerably less winding life. It is true that over a period of time, this factor would average out, but it does work to the disadvantage of the railroad having relatively new locomotive equipment. Consequently, it was felt that a railroad-owned and operated shop would be desirable, if the cost of construction could be justified.



Electrical equipment from Southern shops, such as those at New Orleans, Atlanta, Jacksonville, Memphis, etc., had to be shipped to Chicago, which involved off-line, as well as on-line haulage, and considerable time was lost in transit. Motors which were sent to local service shops did not receive a fully adequate overhaul, since very few of these shops were equipped with vacuum impregnators and balancing equipment to perform the work in accordance with manufacturers' specifications. The billing costs were also high, due to the small volume of work and the expensive equipment required in the repair shop.

It should be noted here that all the electrical manufacturers have now built new service and repair shops in strategic locations or have equipped existing shops with the necessary equipment to perform this work on a production basis. Repair costs have also been reduced materially.

Careful consideration was given to determine the best location for a system traction motor and generator re-

pair shop and the choice was soon narrowed down to a location near existing shops at Chattanooga, Tenn., and Atlanta, Ga. Both of these cities are near the geographical center of the system, and the length of average haul would be almost a minimum. There were no suitable buildings at either point which could be released from service or converted for repair shop purposes. The facilities at Chattanooga comprised a roundhouse and machine shop which were utilized at that time for steam locomotive work. Even if a new building were constructed to serve the needs at that time, there would have been no space available for future expansion.

Facilities at Atlanta, however, included a locomotive heavy repair shop with a number of buildings which might be released from steam locomotive work in the future. While it would be necessary to construct a new building at the start, it was evident that a large amount of building space would be available for expansion when a greater number of diesel-electric locomotives were placed in service. In fact, the entire shop has now been converted for diesel-electric locomotive repair work. Inspection pits and platforms have been installed in a portion of the erecting and machine shop bays for progressive maintenance while the balance of the shop is devoted to diesel heavy repair work.

It was finally decided to locate the proposed repair shop at Atlanta and detailed estimates were prepared to cover the construction of a new building with necessary machinery and equipment. Authority forms were prepared and approved by the management for a total expenditure of $150,000. It was estimated that a saving of $30,000 per year could be realized, based upon overhauling 25 motors per month, with a saving in labor, freight charges, etc., of $100 per motor.

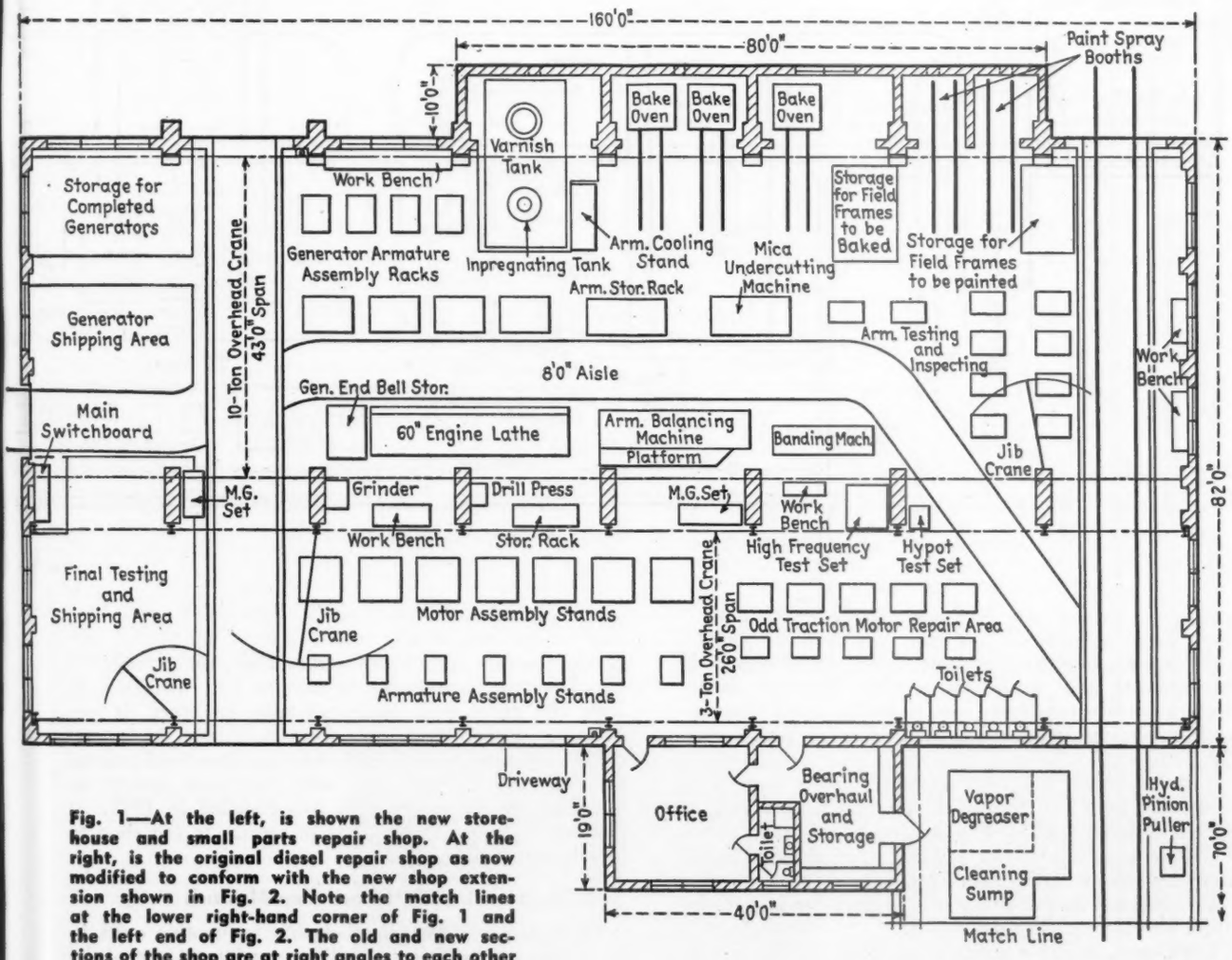


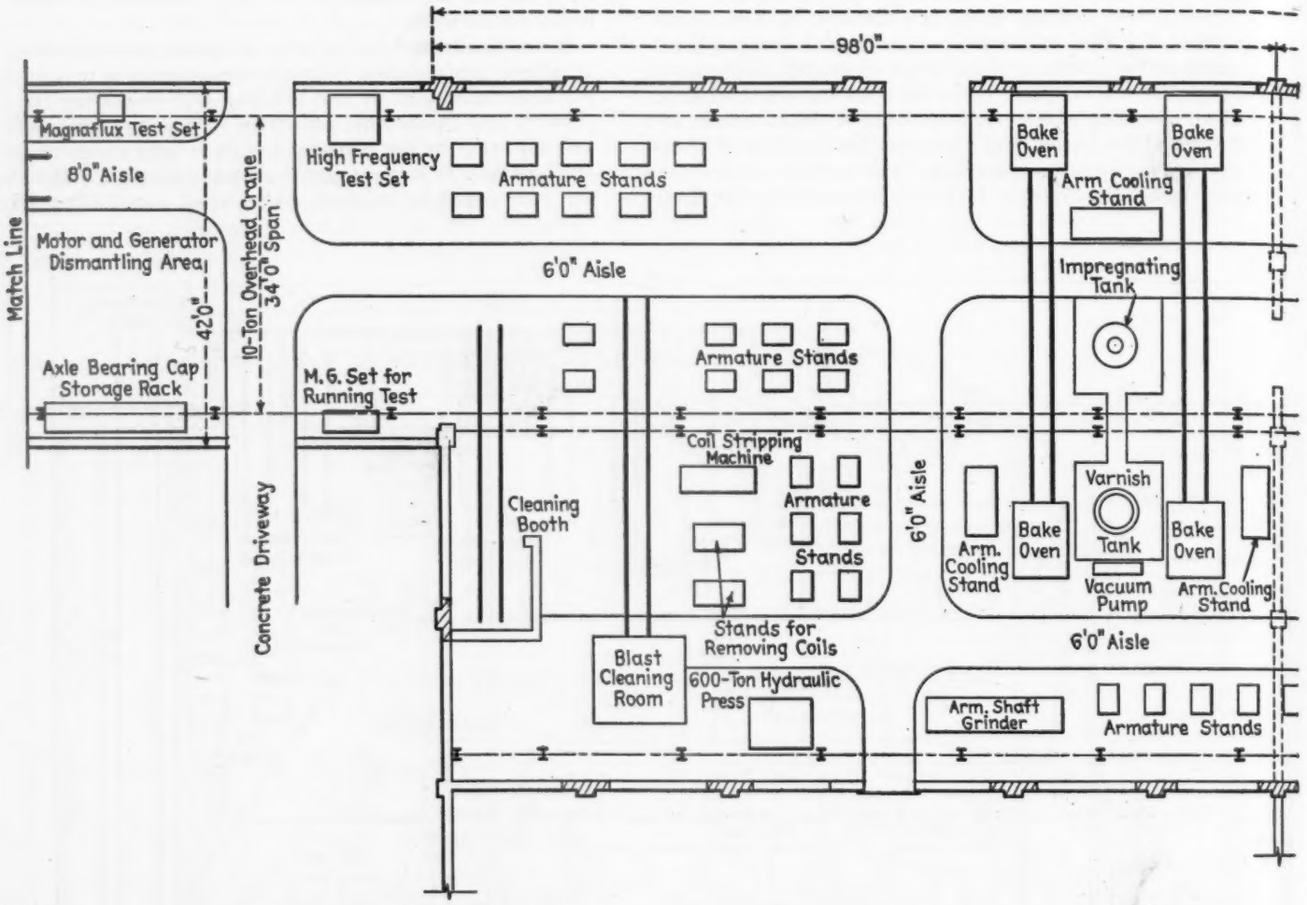
Fig. 1—At the left, is shown the new storehouse and small parts repair shop. At the right, is the original diesel repair shop as now modified to conform with the new shop extension shown in Fig. 2. Note the match lines at the lower right-hand corner of Fig. 1 and the left end of Fig. 2. The old and new sections of the shop are at right angles to each other

The original installation covered a new brick building 82 ft. wide, by 162 ft. long, with two longitudinal bays, and an addition on one side, 19 ft. wide by 40 ft. long, housing office and tool room, and an addition on the other side, 10 ft. wide by 80 ft. long, housing various items of equipment. The high bay provided a clearance of 30 ft. from bottom of roof truss to floor and was equipped with a 10-ton overhead traveling crane. The low bay has a height of 20 ft. from the floor, and was provided with 1- or 2-ton electric hoists on jib cranes for handling parts.

The following equipment and machinery was included in the original installation:

1 Gisholt Type 6U Dynetric balancing machine.

1 10-ton overhead traveling crane.



1 Vacuum impregnating unit consisting of one each, impregnating and varnish tanks, 60-in. diameter, 60 in. deep, a surface condenser, and a motor-driven dry vacuum pump; manufactured by J. P. Devine Manufacturing Company.

1 Compartment car type armature baking over, 5 ft. 6 in. wide by 6 ft. deep by 7 ft. 4 in. high, arranged for electric heat, as built by Young Brothers Company.

1 Cincinnati double-end pedestal grinder for 3 in. by 18 in. by 1½ in. wheels with 5 hp. a.c. motor.

1 Cincinnati double-end bench grinder for 1½ in. by 10 in. wheels with 1-hp. a.c. motor.

1 300-amp. portable welding machine.

1 Electric Service Supplies Company heavy duty armature machine for banding armatures and grinding, turning and undercutting commutators.

3 2-ton electric hoists.

2 1-ton electric hoists.

1 3-kva. hypot testing machine, 0-3,000 volts secondary, 115 volts, single-phase, 60 cycle primary.

1 N. A. Strand & Co. Type M-7 flexible shaft grinder.

1 Group winding head for manufacture of coils.

1 Coil taping machine.

1 18-in. insulation folder.

1 Coil spreader.

Miscellaneous meters test instruments, pneumatic tools, hand tools, etc.

Construction work on the building was started and progressed as rapidly as possible, but due to the difficulty in securing priorities as well as delivery of materials and equipment, the shop was not placed in full operation until the summer of 1944. By that time, the number of diesel-electric locomotives in service had increased to over 100 units, with additional units on order. It was evident, at that time, that some additional tools and equipment were needed to handle the increased volume of work. For example, one bake oven soon proved inadequate, and a second unit was installed in 1945. At present, there are three ovens in service in the shop to handle this work.

Will Overhaul 167 Motors Per Monnth

There are now 594 diesel-electric locomotive units in service on the Southern, handling over 80 per cent of the passenger and freight traffic. Additional locomotive units are on order, and it is expected that complete dieselization may be accomplished in the next several years. This will probably require over 1,000 units of freight, passenger and switcher types.

The size of the load on the traction motor repair shop can be appreciated when it is noted that 1,000 diesel units will have 4,000 traction motors, over 1,000 main and auxiliary generators and possibly 4,000 to 6,000 small motors to be overhauled and reconditioned at regular intervals. If we assume mileage overhaul of traction motors of an average of 200,000 miles service, and a locomotive 100,000 miles per year in all classes of service, it will be necessary to overhaul 167 motors per month. Some of these motors will have armatures requiring rewinding and, if we assume 750,000 miles average service before rewind, it develops that 44 armatures must be rewound each month. In other words, the expected shop

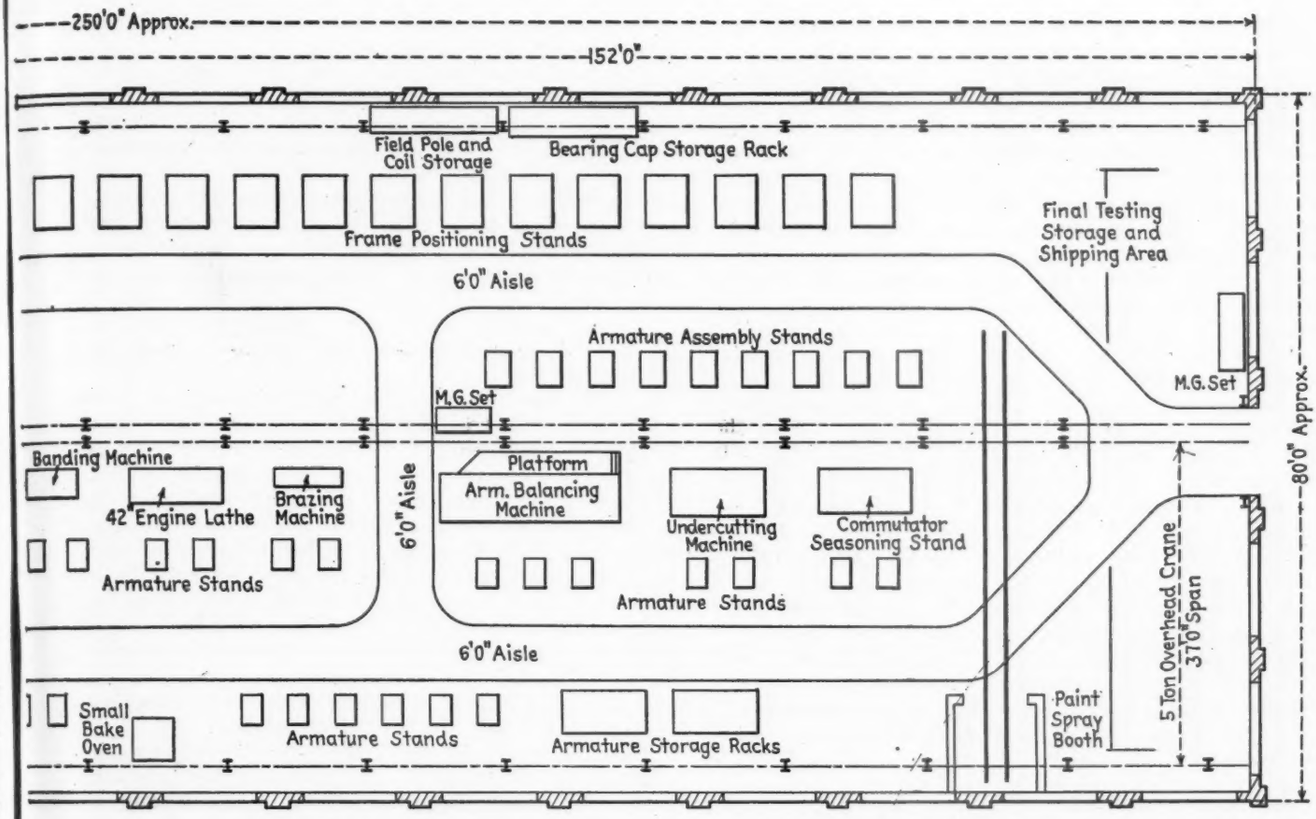


Fig. 2—Ultimate layout of machinery and equipment in the new shop extension

load with 100 per cent dieselization will be an average of 123 motors for basic overhaul, and 44 for rewind each month, a total of 167 motors per month.

Main and auxiliary generators will operate for greater mileage between basic overhaul and rewinds. With 1,000 locomotive units in service, it can be estimated that there

Rewinding area in former blacksmith shop with new extension and entrance to original shop in the background

will be 8 main generators for basic overhaul, and 8 for rewind, each month in the near future.

It should be noted however, that these figures represent average loadings. Orders for new locomotives are usually placed and deliveries received in groups so that there may be a decided difference in the number of motors scheduled for overhaul or rewind from one month to the next. There is some tendency for the peaks and valleys to be leveled out. For example, the number of motors removed from locomotives for overhaul is dependent on the number of spare motors available on the system. If sufficient spares are not available, the traction motors may be operated somewhat over the specified changeout mileage before they can be removed from service. These peak conditions are very important in the operation of a shop, and must be considered in the planning of the shop layout and equipment.

At present, the traction motor shop at Atlanta has an average output of 85 traction motors per month, approximately 10 of which are rewinds, 8 main generators for basic overhaul, and 8 auxiliary generators for basic overhaul. This increase in the volume of work over the original estimate of 25 traction motors to be overhauled each month has made it necessary to provide increased floor space and additional equipment.

The new building, completed in 1944, was placed in an area adjacent to what was then a flue shop, and across a transfer table pit from a group of buildings housing a blacksmith shop, pipe and tin shop, boiler shop and electric shop. It was anticipated that space in these buildings would be available as traction motor shop repair work increased, and steam locomotive work declined. Actually, as mentioned previously, the entire shop was converted to diesel-electric locomotive work several years ago, and unlimited space is now available for expansion. Fig. 1 shows the original traction motor repair shop at the right. At the left is the more recently developed diesel storehouse and repair shop for auxiliary generators, traction motor parts, small motors, train control, etc.

As the volume of work increased further, studies were made and an expansion program was recommended to provide space for immediate needs as well as to develop just what would be required in the ultimate arrangement. As a result of these studies, a new addition approximately 42 ft. wide by 70 ft. long was constructed connecting the original traction motor shop to the building housing the blacksmith shop. For the present, blacksmith shop work is concentrated in a portion of this building, 80 ft. wide by 152 ft. long, separated from the motor shop by a brick partition wall.

In addition to the floor space in the new extension, this made available additional space, 80 ft. wide by 98 ft. long. Two crane runways were installed, one for a 10-ton crane, extending from the original building wall, through the extension and up to the existing partition wall, a total length of approximately 165 ft. The second crane runway parallels the first, and covers the balance of the area in the former blacksmith shop, with a length of approximately 95 ft., and is provided with a 5-ton overhead traveling crane. At the same time, the flue shop building, an irregular shaped building, approximately 90 ft. by 135 ft., was converted for storehouse material and miscellaneous electrical work.

All of the equipment shown in the original traction motor shop (Fig. 1, right) has been purchased and installed with the exception of the high frequency test set, mica undercutting stand and certain armature and frame stands. Equipment such as the 60-in. engine lathe and two bake ovens have been added since the shop was placed in the operation.

The storehouse and small parts repair shop shown at the left in Fig. 1 was formerly the flue shop. Office and floor space is provided for the electrical foreman handling general shop work with space for repairs to shop motors, benches for overhaul of traction motor and main generator field coils, brush holders, frame covers, and for rewinding or repairs to auxiliary generators and small motors. Parts and items of material are transported from one shop to another on outside concrete driveways, however, it is proposed to cut a doorway in the end of the original shop wall to install a short covered or enclosed concrete driveway over the 25 ft. separating the two buildings.

Fig. 2 shows the ultimate layout of machinery and equipment in the new extension and in the entire area of the blacksmith shop. This will eventually include as many as 4 bake ovens, a second vacuum impregnator, a second balancing machine, mica undercutting stand, commutator seasoning stand, 600-ton vertical hydraulic press and grinder for shafts, high frequency test set and blast cleaning room. A lathe for stripping coils from armatures, the brazing machine, armature stands and a new banding machine have already been installed in the space between the new extension and the existing brick partition shown in dotted lines, while a vapor degreaser has been provided in a corner of the new extension adjacent to the wall of the original building.

The arrangement in Fig. 4 illustrates clearly the space available for expansion beyond the brick partition and the entire L-shaped layout is believed to be adequate in floor space to handle all diesel-electric locomotive traction motor, main generator, auxiliary generator and small motor work when the Southern system is completely dieselized.

Traction motors, generators, etc., are removed from locomotives in the erecting shop or are unloaded from freight cars received from other points on the system by means of an outside overhead traveling crane near the storehouse building. Gasoline tractor drawn trucks are used to haul them into the 42 ft. by 70 ft. extension where they are unloaded by means of the 10-ton overhead crane. At present, armatures and frames, after dismantling, testing and cleaning, move into the original shop for mileage overhaul. Armatures for rewinding move into the former blacksmith shop, where they are stripped and rewound as far as possible with the facilities now provided. They are then moved to the original shop for impregnating, baking, balancing etc., after which the armature and frame are assembled and tested in that building. When sufficient equipment has been provided, it is proposed to use the original shop building for mileage overhaul, and the entire area of the blacksmith shop for armature rewinds and frame repair with final assembly located as shown at the far end of the building.

An 8,000-lb. Yale & Towne fork lift truck, tractor, trailers and gasoline-operated Chore Boys have been provided in addition to the overhead traveling cranes covering various areas, for transporting frames, armatures, coils, parts, etc., from one section of the shop to another. Experience, thus far, with the sectional shop arrangement indicates that efficient operation can be secured without too much lost time or expense in moving materials from one area to another and future expansion will be generally in accordance with the ultimate layout shown in the drawings.

The operating procedures in this shop will be discussed in detail in a subsequent issue.

CONSULTING DEPARTMENT

Employee Morale

Proper maintenance of diesels requires facilities, material and skilled men interested in the work. How can morale be made an active factor in the diesel shop?

Can you answer the following question? Answers should be addressed: Electrical Editor, Railway Mechanical and Electrical Engineer, 30 Church Street, New York 7.

In your March issue you asked how morale can be made an active factor in the diesel shop. To my way of thinking there is nothing else quite so important as the foreman in building up good morale. Now what I want to know is how do we find good men for foremen and how do we train them for the job?

There Are Three Primary Requirements

The arrival of the diesel-electric locomotive has brought many new problems to the railroads. Most important among these are labor relations and employee morale because trains are operated and maintained by people. Management and labor both have a job to cope with this complex problem. It must be solved if the railroads are to maintain their firm position as the No. 1 carrier of the nation's goods. This problem will not be solved by name-calling or casting aspersions at either labor or management.

Undoubtedly, there are or have been examples of soldiering and feather-bedding in every railroad shop in America. Examples of older employee's wilfully withholding information from younger men could easily be found in shops twenty or more years ago and still may be found in many shops. These deplorable conditions should never have existed, but to condemn blindly specific individuals or labor in general for their existence is as false as the medieval practice of beating lame and deaf children because they were believed to be possessed by devils.

The challenge to both labor and management is to get at the root of the problem. Adequate remedies can be applied only after careful diagnosis of the disease-producing agents. Let us assume, until it has been proven otherwise, that both labor and management are fair, honest and conscientious parts of an enterprise necessary to the welfare of our democracy and our way of living. We should all recognize that men are inherently reasonable persons and not basically malicious or dishonest. Fear, misunderstanding and improper guidance may drive any man to do unjust or short-sighted things because self-preservation and the protection of our material wealth are uppermost in all of our minds. This condition of fear is not the natural condition for men.

Displacing the steam locomotive and fitting in the diesel-electric units on American railroads have required much study and modification of existing shops and facilities and the changing of many operating procedures. It should have been evident to all persons concerned that problems and similar changes might have to be made with regard to the employees servicing these units. Where this problem has been recognized and faced honestly by both labor and management, the employees are happy, morale is high, and the railroad is in a prosperous condition. Where these problems have been ignored or handled inadequately, the reverse is true. These conditions should emphasize further to both labor and management that the job is not done until each employee is familiar with his new job, is happy in his work and is working in the best surroundings with the most efficient tools and training that modern advancements can provide. If both labor and management will approach the problem from the standpoint of training employees so that they no longer fear the intricacies of the equipment involved, and providing proper facilities and surroundings for good work, they will find that the problem of soldiering and wilfully withholding information will be reduced to an almost imperceptible quantity. This, in my opinion, is the only way that this cancerous growth of employee dissatisfaction and feather-bedding can be corrected. It certainly cannot be corrected by badgering or threatening; nor can it be corrected by restrictive rules, regulations or law-making.

To put into words the one element most likely to cause employee dissatisfaction is like trying to capture a graveyard ghost. Much philosophizing has been done about what man needs to be happy in most real and imaginary situations. I will not add to these volumes but will point out some items that loom large in my memory of twenty or more years of supervisory work.

Honesty and fairness were the most needed elements on both sides of the labor relation scales twenty years ago and are still the most needed element. This may seem like a contradiction of the fact that men are basically honest but it is not. Men, supervisors and employees, alike, are basically honest and fair but fear or ignorance drives them to dishonesty.

How many cases have you heard of men working on a job for five, ten or fifteen years and then learning that they were denied advancement or being discharged because they were unsatisfactory or unqualified? What justification can any supervisor have for permitting an unsatisfactory employee to waste five or ten years of his life on a job holding no future for him and not honestly and clearly telling the man what his standing is? How many foremen honestly, conscientiously and courageously talk over in private each month with each man under his direction that man's limitations, strengths and weaknesses? I know the answer. Lack of time and many job responsibilities loaded on the foreman do not permit these time-consuming practices. Can management then hold themselves blameless for the conditions of dishonesty, unfairness and selfishness on the part of the workers when their own short-sightedness provides an incubator for these corrosive diseases? What other job could possibly be more important to a foreman or a management than the peace of mind of his workers?

Constructively telling a workman about his weak-

nesses, inability or other limitations is not easy. It demands the utmost in foremanship but there is no other way to get at the root of the trouble except for the foreman to do it. No. 1, therefore, on my list of things to do is the selection of foremen who are honest, courageous and fair to the N^{th} degree. Instill in these foremen a genuine interest in their fellowmen, train them in the techniques of dealing with people and give them enough time to do their job properly. This is not a short-time program but a continued campaign that sometimes takes a long time to bear fruit. This will do more to improve employee satisfaction than all of the other benefit plans put together.

The second item on my list of things to do is to increase the knowledge of the individual worker. This again is a job that must be handled on almost a person-to-person basis because of old fears and misunderstandings that have built up through the years. Shop schools, text books and special training courses are examples of management's attempt to cope with this problem. Manufacturers also can assist by writing and making available instruction books that the average workman can understand. These attempts on the part of management are laudible and their failure to correct the situation in some cases should not discourage their continued use. Such programs succeed as a direct function on the individual's willingness and desire to participate in them. Here, again, management should not be selfish in what it teaches. Perhaps better electricians are needed but the willingness to learn might be encouraged by giving a course in amateur "radio" or "oil painting".

The third item is as old as the hills. This element is to take the worker, the foreman and the janitor into the confidence of the management. There is nothing in the world that gives a quicker appreciation of your problems than to ask a man to help you solve them.

I would like to say a lot more, but these three are my major recommendations. Why don't you try them for a year and see if they do not produce improved results?

EDWARD STERLING LOWE

Jealousies Must Not Be Allowed to Flourish

I think I can best answer your question on how morale can be made an active factor in diesel shops by citing my own experience. In 1936, I started out as an electrician rider on our diesel-electric streamliners. I was very enthusiastic and studied everything on the trains diligently, so I could become the best man they had. And I soon gained the satisfying reputation of being just that. I rode thus for 11 years. Then, the superintendent of diesels asked for my promotion to diesel supervisor. This job gave me the opportunity to further expand my knowledge and skill. And this lasted satisfactorily for about two year, when the superintendent took his pension.

His place was taken by a man who received his appointment through the vice president. This man had had no previous railroad experience, but he was nevertheless a competent and intelligent college graduate. But he had, and still has, the disagreeable habit of treating non-college railroaders with condescension, and apparent contempt.

At this time, I personally, as well as all other diesel supervisors, were placed under master mechanics in various divisions of the railroad. And I had the misfortune of being placed under a man who carried his craft grudges into his high position. He was an ex-machinist, and I an electrician. And he wanted a machinist as an assistant. I didn't realize this for a long time, but I did notice that subversive propaganda, detrimental to me, was beginning to show itself. After a year and a half of this, I was demoted, and a machinist appointed in my place.

This was demoralizing, and the entire railroad felt the impact of it. All electricians have become resentful. Other officers of the railroad have become apprehensive, and are watching their superior's actions with suspicion.

On top of this, there is a strong tendency to hamstring the electrical department by refusing to appropriate money for such things as meters, and other testing equipment, or to provide the necessary wiring diagrams for an efficient electrical force.

These things are not conducive to good, efficient operation of diesel electrical equipment, and should be corrected.

What happens to me is not of such great moment, as I'm working as an electrician again, the youngest man at the point. But this is an example of how thoughtless and short-sighted railroad management can become. The plausible excuse given for my demotion was lack of supervisory ability. Well, this was partly true, because I was prevented from exercising supervisory functions by the master mechanic, who feared for the safety of his own job, and realized the threat of the electrical men in being promoted to the higher jobs.

I don't know if this example answers your question in a small way or not, but I believe it illustrates a condition that exists that should be given enlightened treatment.

GEORGE PERRY

Diesel-Electric Locomotive Batteries

Questions and Answers

Q.—How can proper cable arrangement and tray blocking provide a better battery installation?

A.—Battery terminal leads and intertray connectors should be arranged to prevent undue strain on the battery terminal posts.

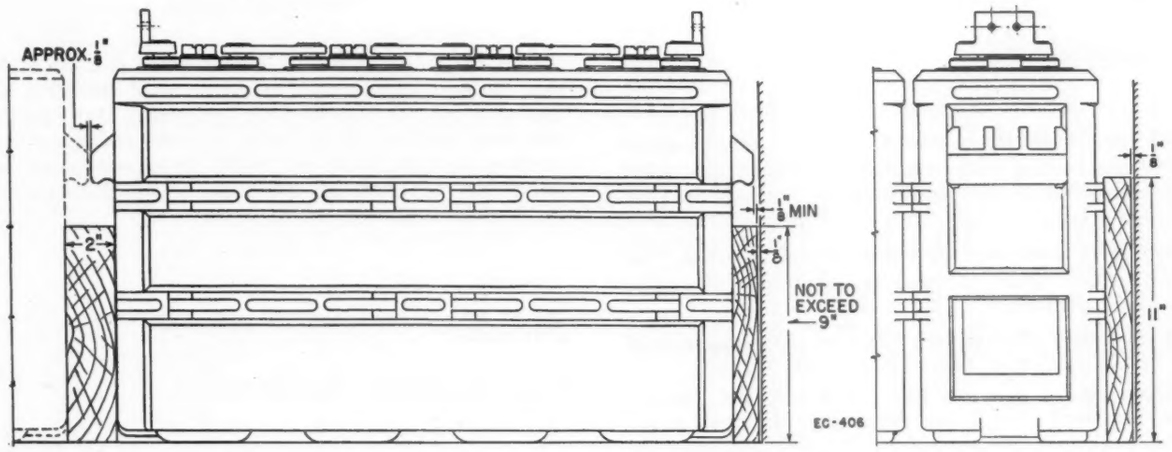
The cables should not rest on the intercell connectors, and should be of ample length. Proper arrangement of

Quartet of diesel starting batteries showing neat cable arrangement and tight bolted connections

cables will prevent crushing between the trays, or the trays and battery compartment. Service records of The Electric Storage Battery Company show that rubbing action may destroy the insulation and cause grounds.

The cleaned parts should always be washed thoroughly in clean water and then dried.

S. K. LESSEY
The Electric Storage Battery Company



Recommended blocking for Exide Ironclad diesel starting batteries, Type MV-D

It is essential that the battery be well blocked in the compartment to prevent excessive moment. Clearance between battery and blocking at sides, back and front, should normally be about 1/8 in.

Blocking for "monobloc" trays should be high enough to bear against reinforcing strips on the sides and ends of the trays. The end blocking should not be higher than 9 in. above the tray bottom. The side blocking must engage both the upper and lower container ribs as shown in the sketch. This is illustrated by the diagram.

Do not wedge!

Q.—What is the procedure for making bolted battery connections?

A.—Before connecting the battery, clean the contact surfaces of the solid lead terminal posts with a wire brush. The lead-coated copper lugs and intertray connectors should not be cleaned with a wire brush, since the thin lead coating might be removed.

Apply a thin coat of Grade A, No-Ox-Id grease to all contact surfaces connector bolts. Tighten the connector bolts securely by using two wrenches, not over 6 in. in length (preferably box type), one on each connector bolt nut. The use of two wrenches lessens the strain on the battery terminal posts.

After all connections have been securely tightened, they should be gone over and tightened a second time. All connections should then be wiped off with a clean cloth to remove the surplus grease. The four batteries in the illustration have been properly connected and cleaned of grease.

Heavy currents are required to start a diesel engine. Tight and clean connections will help prevent starting failures.

The Electric Storage Battery Company recommends that corrosion on connector bolts, lugs and cables be removed by washing in a hot soda solution, consisting of one pound of commercial bicarbonate of soda to one gallon of water. Severe cases of corrosion are removed more quickly, and effectively, if the solution is near the boiling point.

A. C. Power Plants For Passenger Cars

(Continued from page 72)

controlled by superimposing d.c. excitation upon the regular a.c. excitation on the core. The d.c. excitation is varied through a motor-operated rheostat which is, in turn, controlled by the car-temperature system. Excellent modulated control of the overhead electric heat is obtained in this manner.

Controls for the air-conditioning and generating equipment are relatively simple. All controls for air-conditioning equipment are placed on a Micarta panel. Equipment on this panel includes contactors for each compressor and evaporator fan. Panelboard-type breakers are used for each of these pieces of equipment as well as the electric-heating circuit. The remaining item on the panel is a timer that prevents the compressors starting at the same time. The timer is necessary to prevent light flicker at temperature conditions that would place the two compressors on the line simultaneously. The second compressor is thus prevented from starting until 15 seconds after the first one starts. Controls for the power plant are placed on a Micarta panel and include the main line contactor and breaker along with two control contactors. The equipment is fully automatic, one push-button being pressed to start the entire system in operation and another to stop it.

The Rock Island car "Northfield" had been previously equipped with 32-volt, d.c. lighting. It was decided to leave these lamps in and operate them on 32 volts a.c. through a 220-32-volt transformer.

The car battery required for the system is rated 284 amp.-hr. and its function is to provide emergency lighting for a period of eight hours in addition to providing power for the control system, alternator main field, and engine starting. Charging of the battery is accomplished with a selenium 60/25-amp. two-rate charger.

QUESTIONS AND ANSWERS

Diesel-Electric Locomotives

Alarm and Indicator Lights

193-Q.—Explain the operation. A.—When the temperature of the cooling water reaches 185 deg. F, the high water temperature switch will close causing the hot engine red lights to light.

194-Q.—Is there any additional alarm? A.—Yes. The buzzer sounds (road locomotives only) as well as the alarm bell in all units.

195-Q.—Does this have any effect on the engine speed? A.—Yes. The affected engine is returned to idle.

196-Q.—When does the Low Lubricating Oil Pressure Light function? A.—When the engine lubricating oil pressure drops to 20 psi. but not below 7 psi., with the throttle in the fifth, sixth, seventh or eighth notch and with the engine control switch in *6* or *run.*

197-Q.—What switch is operated at this time? A.—The oil pressure switch OPS-1 will open and light the low lubricating oil pressure green light.

198-Q.—What further action takes place? A.—The buzzer sounds (road locomotives only) and the alarm bell in all units and affected engine returns to idle.

199-Q.—What happens if the oil pressure drops to 7 psi. or less? A.—Switch OPS-2 will open causing the alarm to sound and the affected engine to shut down regardless of throttle or engine control switch positions.

200-Q.—With what equipment is the Boiler Flame Out light associated A.—The steam generator.

201-Q.—When does this light function? A.—When the steam generator stops.

202-Q.—Explain the operation. A.—The boiler alarm relay will close, causing the boiler flame out light (white) to light, buzzer (road locomotives only) and the alarm bells to sound in all units.

203-Q.—What is the purpose of the Ground Relay and Blower light? A.—On road locomotives, if a ground occurs in the high voltage circuit of any unit or connected units, the white ground relay and blower light will light in the unit affected.

204-Q.—What further action takes place? A.—The buzzer and alarm bells will sound in all units and the affected engine will return to idle.

205-Q.—For what other purpose is the ground relay and blower light? A.—It indicates a traction motor blower failure.

206-Q.—How is this indicated? A.—The white light will light in the affected unit and the buzzer and alarm bells will sound in all units.

207-Q.—How is a ground detected on a single or multiple connected road switching locomotive? A.—The white ground relay light will light, the engine affected will return to idle while the alarm bell will ring in all locomotives.

* This series of questions and answers relates specifically to the Alco-G. E. diesel-electric locomotives.

Correction Notice

In diesel-electric locomotive questions published in the February issue the answer to question No. 117 stated that the 6-SL equipment is used on road switchers and that older models have the 6-DS equipment. Our attention has been called to the fact that on road switching locomotives the 6-SL, 6-BL and 24-RL brake equipments are being currently installed. The older models have had the 6-DS and 14-EL equipment.

Steam Locomotive Boilers

By George M. Davies

Cold Bending of Pipe

Q.—What is the best method for cold bending extra heavy wrought iron pipe?—A. M. B.

A.—In making a pipe bend, the stretch in the metal has a tendency to localize at the central portion of the bend rather than to distribute itself uniformly. Therefore, successful results are obtained only by following a practice that will permit no portion of the bend to stretch the pipe beyond the safe limit.

When bending pipe, either by hand or machine, it is desirable to conform to three main requirements:—

1. The bending stress should be applied successively to short sections of the pipe.

2. The bent or stretched pipe should be advanced out of the bending zone and should not be subjected to further stress.

3. The force which does the bending should be applied as a steady pressure and not as a sharp blow or impact.

What Determines Water Space?

Q.—The water space between the firebox sheets varies on the different classes of steam locomotives but generally the water space between the firebox side sheets is less than the water space provided at the throat sheet and at the backhead. What is the reason for this?—R. E. L.

A.—The properly designed boiler provides ample water space around the fiebox so that the water from the barrel of the boiler can readily pass thru the throat, back along the sides of the firebox and up along the backhead without being retarded as a restricted water space can result in burned out side sheets and staybolt trouble. The general practice is to provide ample water space between the firebox sheets increasing the width of the water space at the throat to make it easier for the water to back along the side sheets and at the backhead so as not to restrict the flow of the water up and over the backhead.

Capacity of Automatic Blow-Down

Q.—On a locomotive equipped with an automatic continuous blowdown, how does the amount of water blowdown compare with the amount discharged from the conventional blow-off cock?—F. E. C.

A.—The following tables give the comparative amounts

of water blow-down by the conventional blow-off cock verses an automatic bow-down system.

1½ In. Blow Off Valve

Gage pressure	Gals. per sec.	Gals. per min.
188	2.92	175
190	3.05	183
200	3.10	186
210	3.17	190
240	3.40	204
250	3.47	208

2 In. Blow Off Valve

180	5.20	312
190	5.37	322
200	5.50	330
210	5.62	337
240	6.03	362
250	6.13	368

Constant Blow Down

Pressure	Size of Orifice (In.)	Gals. per min.	Gals. per hr.
180	5/32	3.7	222
200	5/32	3.9	234
240	5/32	4.3	256
180	6/32	5.3	320
200	6/32	5.6	338
240	6/32	6.1	370
180	7/32	7.3	435
200	7/32	7.7	460
240	7/32	9.3	504
180	8/32	9.5	567
200	8/32	10.0	600
240	8/32	11.0	658
180	9/32	11.9	715
200	9/32	12.6	756
240	9/32	13.8	829
180	10/32	14.7	885
200	10/32	15.6	938
240	10/32	17.1	1031

Toe Brick in Locomotive Arches

Q.—What are the advantages of using toe brick in the arch of a locomotive boiler?—R. F. K.

A.—The use of toe brick in the arch of a locomotive boiler is to set the front row of arch brick away from the tube sheet a distance of from 5 to 6 inches, in order that the cinders collecting at the bottom of the arch will drop down into the firebox and not plug up the bottom flues. The advantages of the open or vented arch are at best very controversial and depend a great deal on the fuel used, the open arch being most advantageous in territories where the fuel cinkers when when burned.

Schedule 24 RL Air Brakes

Automatic Train Control

1108-Q—What is the function of the A-1-suppression valve? A.—This valve is recommended when temporary and permanent suppression of train control application is desired.

1109-Q.—How does the acknowledging valve function? A.—This valve is for the purpose of permitting the engineman to properly recognize the change to a more restrictive indication, also to permit a train movement at the low speed limit under a restrictive indication through medium of recurrent acknowledging operation.

1110-Q.—When are the No. 1 and No. 2 acknowledging reservoirs used? A.—The No. *1* acknowledging reservoir is only used when operating under an intermittent magnetic induction stop system. Both No. *1* and No. *2* reservoirs are used when operating under a two-indication continuous cab signal system with two-speed control or without speed control.

1111-Q.—What does the Suppression Reservoir 19 provide? A.—It provides a permanent suppression of a train control brake application when a manual automatic brake application of prescribed amount is in effect.

1112-Q.—How does the Suppression Timing Reservoir function? A.—This reservoir is connected to the automatic suppression portion through the rotair valve for the purpose of providing continued automatic brake valve partial suppression of a train control brake application by means of successive manual brake pipe reductions of moderate amount when the rotair valve is set in FRGT position.

1113-Q.—What is the purpose of the timing reservoir? A.—It serves as an operating volume in combination with the timing valve to hold the train control brake application suppressed for a period of about six seconds after the timing valve is de-energized.

1114-Q.—What does this permit? A.—It permits the operator to move the brake valve to a brake applying position, wherein suppression of a train control application is governed by the positioning of the brake valve or the degree of brake application.

1115-Q.—With what basic types of automatic train control and cab signal devices is the 24-RL equipment adaptable for? A.—A—Continuous cab signal system with speed control; B—Continuous cab signal system with automatic stop; C—Continuous cab signal system with whistle and acknowledger; D—Intermittent automatic train stop.

1116-Q—What does the Cab Signal System with Speed Control provide for? A.—The initiation of an automatic service brake application when pre-determined speed limits in accordance with signal indications are exceeded.

1117-Q.—Can this brake application be suppressed? A.—Yes.

1118-Q.—How is this done? A.—This brake appication may be suppressed if the engineer initiates and maintains a full service manual brake application until the speed has been reduced below the predetermined limit.

1119-Q.—What does the Cab Signal System with Automatic Train Stop provide for? A.—The initiation of an automatic service brake application and stop, when the signal changes to a more restrictive indication.

1120-Q.—How may this brake application be forestalled? A.—This brake application may be forestalled by the engineman if the signal change is acknowledged within approximately six seconds.

1121-Q.—Does the Cab Signal System with whistle and acknowledger include any automatic brake applying features? A.—No.

1122-Q.—What does it provide for? A.—The sounding of a whistle following each change to a more restrictive signal indication.

1123-Q.—How long does the whistle sound? A.— Continues to sound until acknowledged by the engineman.

1124-Q.—What does the intermittent automatic stop system provide for? A.—The initiation of an automatic brake application and stop when the engine passes a *Stop* or *Approach* wayside signal.

EDITORIALS

Super-Vision For Supervision

Railroad supervisors need *super-vision* today as never before and the question is where are they going to get it. Some very pertinent comments on this subject were included under the title mentioned above by H. C. Marmaduke, executive representative, Illinois Central, in addressing the April 9 meeting of the Car Foremen's Association of Chicago. In this talk, the point was made that when a competent workman, Sam, is promoted to boss, however humble, he receives no touch of a magic wand to make him, overnight, a competent leader, trainer and developer of men. There are no high-power glasses which can be placed on Sam's nose to give him all-seeing eyes. Except for the few instances in which Sam is perhaps a natural-born supervisor, there is no recourse but for him to learn from his own experience and that of others which may be available for study in lesson form.

Mr. Marmaduke was on sound ground in saying there are many things which will be helpful to Sam, but attention to the five following fundamentals will solve most of his problems: Study the subordinates who work for him; learn to like and be considerate of them; delegate responsibility; let others in on company plans; and make people want to do things by leading instead of driving and always giving credit where credit is due.

By the same token, there are many things for a supervisor to guard against such as: Keeping men on jobs for which they are not fitted; failing to realize that some men can't stand praise and others criticism; giving any evidence of partiality, unfairness, lack of courtesy, consideration and willingness to credit subordinates with all worth-while ideas they may originate.

One of the major things to guard against, and an error frequently encountered, is keeping subordinates in ignorance of what is going on and why. Probably plans and programs cannot in all instances be publicized too far in advance, but in general it is a good idea to discuss changes with those involved beforehand, so they can make suggestions and feel some personal responsibility for success of the plan finally adopted. This will make the practical carrying out of any particular plan much easier.

Constant study, reading selected books and trade publications, such as *Railway Mechanical and Electrical Engineer* in the railway field, are essential for supervisors to know what is going on in their industry and thus be better qualified to direct their subordinates more efficiently. Returning to the idea of Sam and his glasses, Mr. Marmaduke interestingly suggests that, if he were a great oculist, he would fit this supervisor with bifocals for distance vision in planning and short vision for the job in hand. He would grind the lenses for human consideration and kindness, delegation of responsibility, full consultation in planning and leadership in production. Such a prescription would undoubtedly be difficult to fill, but who would doubt its effectiveness in giving Sam Super-Vision?

Mr. Marmaduke's discussion, like most others of this subject, is devoted to the technique of supervision, that is, the know-how. This, and certain characteristics of personality which he mentions are important. One personal characteristic which is of supreme importance, however, is seldom mentioned in any discussion of this subject. That is a character of such strength that it is never afraid to face issues—never afraid to deal fairly and forthrightly with all personal problems as they arise. Without this quality, the know-how and the best of intentions will never achieve complete success.

Dignified Acquiescence Vs. Enthusiastic Cooperation

Shop operators will generally agree that employee morale is the most important factor in successful shop operation: that wooden ships and iron men are to be preferred to iron ships and wooden men. Of course, it should not be inferred from this that good shop equipment is unimportant, but it must always be recognized that a poor piece of equipment will work pretty well if the operators like it and understand it, and even the best will fail if they don't. Similarly, if the men like the work in the shop, and understand that they are personally responsible for an important part of the job, the quality of output will improve accordingly.

Some railroad conditions which discourage the enthusiastic young man when he starts working in the diesel shop were outlined in the March, 1951, issue in an editorial entitled, "The Neglected Tool." This told only part of the story, and it brought prompt response from the forthright Mr. Lowe. In the Consulting Department of this issue, with convincing sincerity and understanding, he states that there are three primary requirements for establishing and maintaining good shop morale. Also, in this issue, George Perry recites his own experiences which show the effect of personal differences, petty jealousies and fear.

Perhaps Mr. Lowe has oversimplified the solution to the problem. Probably the circumstances described by Mr. Perry must always be expected in greater or less degree. But one thing is certain. If it is discussed broadly, so that all sides of the question are understood by everyone, there will be little opportunity for bad behavior on the part of anyone. The dignified acquiescence

that results from being told exactly what to do will be replaced by enthusiastic cooperation when workers and management come to realize they can benefit equally by working together.

Just how to go about doing this is not simple. There are many things which can contribute to the desired results. Will you let us have your opinions and suggestions?

Smoke Can Be Reduced By Proper Maintenance

Some interesting and useful data for mechanical supervisors concerned with either steam or diesel power is contained in a progress report issued by the city of Columbus, Ohio, on that city's smoke regulation plan. Study of over 1,500 smoke violations for the years 1949 and 1950 show not only that proper maintenance, efficient handling and good fuel are key factors in reducing excessive smoke, but that proper maintenance alone can be a far more important factor in smoke regulation than overloading.

For both years approximately half of the total violations occurred on light locomotives. From this the report concludes, "The old complaint of overloaded equipment cannot be sustained in the face of these facts, . . . supervision must assume its responsibility in closer policing of this type of operation." Another portion of the report states, ". . . good equipment is essential to any smoke regulation program, whether it is diesel or steam power, and it has been definitely proved that if either type of power is not maintained in the proper condition it will quickly become a nuisance to the city."

The figures from which these conclusions are drawn are as follows, and include the years 1949 and 1950: Passenger locomotives, which are in general the best maintained, accounted for only 52 violations compared to 407 for freight and 349 for switching locomotives. The remaining 744 violations out of a total of 1,552 occurred on light locomotives.

Mechanical men can well benefit from the figures and conclusions in this report because smoke regulation is becoming an increasingly greater problem to the railroads. Not only does black smoke represent growing dollar loss as fuel prices increase, but more and more cities and towns are enacting smoke regulation ordinances which the railroads will find far easier to conform to if they know as much as possible about what causes locomotives to emit excessive smoke.

NEW BOOKS

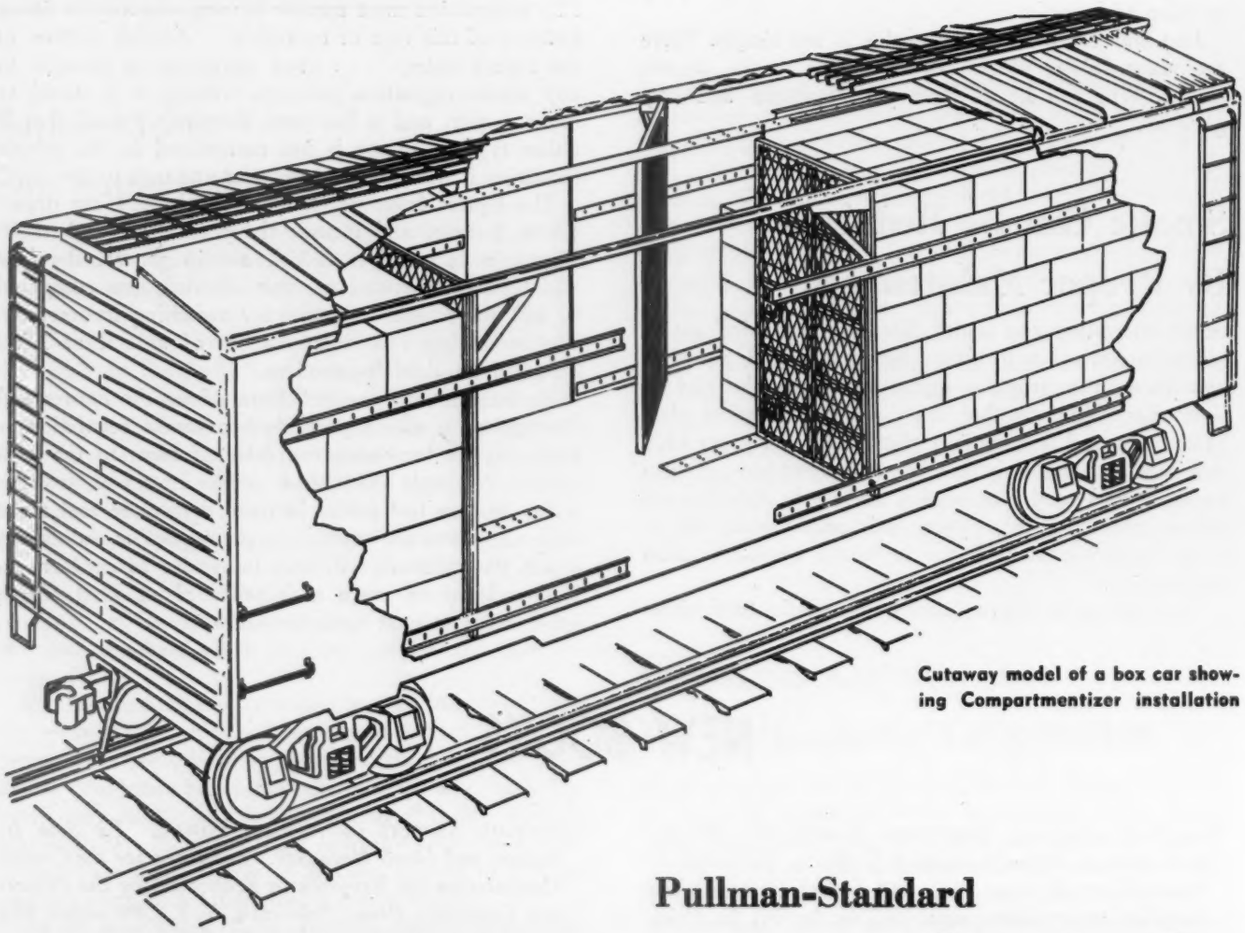
MARKS' MECHANICAL ENGINEERS' HANDBOOK.—*Revised fifth edition. Edited by Lionel S. Marks. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. Over 2,200 pages, 6¼ in. by 9¼ in. Price, $15.*

The index to this fifth edition of Marks' Mechanical Engineers' Handbook has more than 12,000 entries covering theory, standards, and practice in every branch of mechanical engineering— from aeronautics to mechanical refrigeration; from power generation to welding; from metal-cutting machines to hoisting and conveying. Among the new or greatly revised items are: *Theory*—fluid mechanics, elastic and plastic defomation of materials, stresses in turbine disks, transonic and supersonic aerodynamics, aircraft jet propulsion, rockets, radar, television; *Processes*—radiant or panel heating, solor heating, heating by heat pumps, vapor-compression distillation, high-vacuum pumps, modern casting methods, dust explosions, industrial supersonics, machining of plastics, automatic process control, statistical quality control; *Materials*—ferrous and non-ferrous alloys, superalloys for highest temperatures, plastics, elastomers, silicones, adhesives, fibers, explosives, rocket fuels, reflective heat insulation, powder metallurgy; *Power*—gas turbines, atomic power. Many new names appear in the list of over 100 contributors who are specialists in engineering and science. The arrangement of the 16 sections is essentially the same as in the preceding edition. The new and revised material is included in the appropriate parts of the book.

ECONOMIC ASPECTS OF ATOMIC POWER. *By Sam H. Schurr and Jacob Marschak. Published for the Cowles Commission for Research in Economics by the Princeton University Press, Princeton, N. J. 290 pages, 6¾ in. by 10 in. Cloth bound. Price, $6.*

This "Exploratory Study" is confined to those applications of atomic power that seem least remote today. It deals only with applications based on a continually controlled release of energy within a permanent structure (the "reactor") rather than on explosions. Part 1, Economic Comparisons of Atomic and Conventional Power, analyzes questions relating to the supply of energy. Part 2, Atomic Power in Selected Industries, examines the effects of the availability of low-cost heat and power upon the productivity, location, and output of specific industries. Part 3 discusses Atomic Power and Economic Development. Railroad Transportation, one of the selected industries covered in Part 2, is the subject of a 17-page chapter. Section A discusses the important variables affecting the economies of railroad motive power, blocking out broadly the types of regions in which electrification based upon atomic power might be economically justified, and the types of regions for which a reasonable case for electrification cannot be made. Section B considers the important variables in the economics of railroad motive power, and Section C the implications of atomic power for railroad electrification in the future. The appendix to the chapter is on the feasibility of using nuclear power plants in railroad locomotives.

NEW DEVICES



Cutaway model of a box car showing Compartmentizer installation

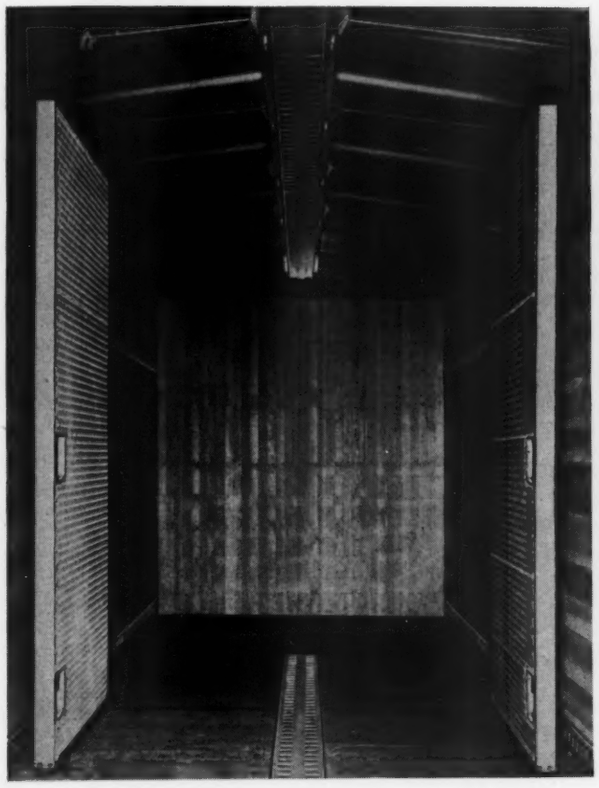
Pullman-Standard Compartmentizer

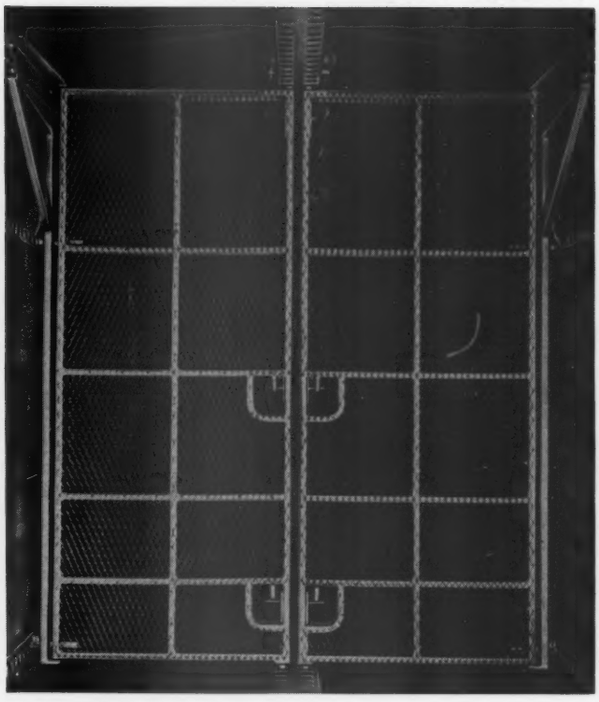
The Compartmentizer, now being made and marketed by the Pullman-Standard Car Manufacturing Company, Chicago, consists of two pairs of longitudinally adjustable steel gates which may be installed in box or refrigerator cars to make three sections of variable size, as needed for stop-off service or some i.c.l. loads. The design reduces the chance of loss and damage claims and does not interfere with the value of the car for general-purpose freight shipments.

Advantages claimed for the new development include: ease of adjusting the gates; increased car loading capacity; shipment segregated for each consignee, individually secured and sealed; safer method of loading, with dunnage eliminated for most shipments and no individual parts to become lost or misplaced.

The Compartmentizer consists of four swinging gates, two right hand and two left hand. Each gate is approximately a 4-ft. by 10-ft. frame made of structural steel channels with all welded construction, covered on each side by expanded metal with openings on one side to allow ready access to locking handles. Gate sides are essentially flat and free of projections.

Hinged steel gate suspension and position indicator, *P*





Left: Compartmentizer with steel gates open ready for loading; Above: Gates closed and locked

Manually-operated means are provided at the inside edge of each gate (both top and bottom) for locking gates near the car longitudinal center line. The locking arrangement is a simple mechanism to allow engaging square steel locking bars in suitable rectangular holes in the pressed steel center ceiling and floor plates.

Each gate is hinged to a vertical pivot member carried by a trolley which operates on a longitudinal track secured to the car side near the roof. One continuous track and two gates are on each side of the car. The gates work independently of each other and may be secured in the same axial straight line or staggered.

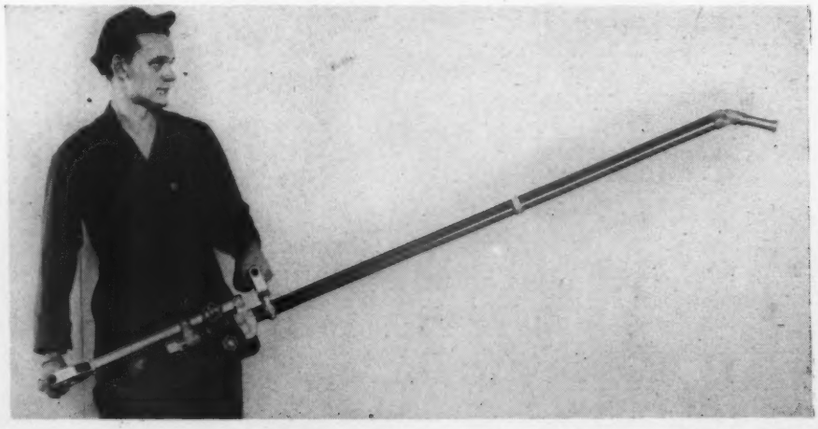
A lateral thrust roller in the lower portion of the vertical pivot member bears against the lower side wall keeper and maintains the gate essentially in a vertical plane for all gate positions. Another identical keeper plate is in the car side near the upper portion of the gate. Two fixed square steel horizontal locking bars on each gate automatically engage with the locking recesses in the upper and lower side wall keepers when the gates are moved into their service "across the car" positions. A visual indicator assists in proper positioning of the gate prior to automatic locking at sides. Locking slots are spaced on 3-in. on centers extending between door post and bolster. Provisions are made for securing the gates when not in use at the car end. Gates are readily removed by dis-engaging upper pivot pins.

Steel keeper plates at roof and floor centerline allow for final manual locking of gates, each one in four places at the roof, floor and car sides. Readily removable access plates in the floor keeper facilitate cleaning. There are no loose pieces in the entire application.

Solution-Lifting Steam Gun

For use in heavy-duty steam cleaning applications, a steam gun, the model 502 Oakite. Solution-Lifting Steam Gun has been announced by Oakite Products, Inc., New York 6. This device is designed for use where range of pressure at boiler end of hose while gun is in use is 50 to 100 lb. per sq. in., with minimum boiler rating of 25 or more hp. recommended. With this gun, the manufacturers report, steam detergent spray is lifted 12 ft. above the working level to provide cleaning of large equipment and other surfaces.

The gun, 7½ ft. long and weighing 15¾ lb. is equipped with two cast alu-



minum spade-type insulating handles. The forward handle remains stationary, while the rear handle easily turns and rotates the entire gun for cleaning in hard-to-reach locations. A safety feature is the reinforced-rubber apron backing up the steam valve and other hot fittings to protect operators from contact burns.

The device is equipped with machined seamless steel nozzle, $^{15}/_{16}$ in. inside diameter and inner jet. A flat nozzle is also available where wide-angle spray cleaning action is desired. Control valve furnished with the gun are a ¾ in. globe valve for steam and a ¼ in. globe valve for solution control. Also provided is a cast brass strainer of fine-mesh brass screening for use at the tank end of the solution hose.

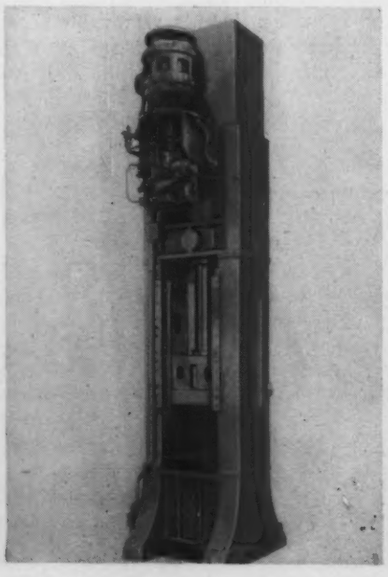
Pipeless Circuit Hydraulic Press

Development of a new principle in hydraulic press construction has been announced by Elmes Engineering Division, American Steel Foundries, Cincinnati 29, Ohio. In these pipeless metal-working presses, the main hydraulic circuit has no piping. The only pipes in the entire press are the pilot, suction, and drail lines, and of these, only the pilot line carries high pressure. All high pressure fluid is conducted through short, direct passages drilled in the structural parts.

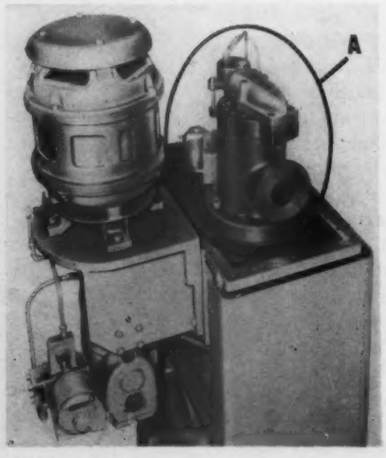
These advantages over the conventional hydraulic system make for remarkable low-cost maintenance, with downtime practically eliminated. The pumping unit can be removed as a unit assembly without disconnecting any piping. The valve unit, located in the reservoir is also removable as a unit assembly. All pumping units and valve groups fit standard bolting and drilling layouts.

Reversing type hydraulic pumps, known to give smooth press performance, are used in the new circuit. Since the shifting and centering system is mounted directly to the hydraulic pump, only electrical or mechanical connections need be made, depending on the style of control.

The pipeless valve unit is the heart of the new unit, containing all necessary provisions for pre-filling during rapid advance, changing to pressing speed by either pressure or position, and decompression prior to reversal. These valves are designed in a wide range of sizes for application to many different speeds and tonnages. Any Elmes hydraulic metal-working press, standard or special design, can be supplied with pipeless construction for the main hydraulic circuit.



The illustration below shows at *A* the pipeless pilot unit.



Recorder Measures Rotor Temperature

An electronic recorder for measuring temperature of rotors in large electric generators has been developd by the Brown Instruments Division, Minneapolis-Honeywell Regulator Co., Philadelphia, Pa.

This unit, named the Electronik has been designed to assist operators in avoiding overloads. In addition, the instrument furnishes a 12-in. strip chart record which can be used as a guide for gradually cooling a generator.

It has a range of 0 to 150 deg. C, a limit error of 1.5 deg. C, a dead zone of 0.3 deg. C, and a pen speed of 1.4 min. full scale. Its range of rotor winding resistance is 0.1 to 4.0 ohms and it has a dielectric test of 1,500 volt rms for 1 min.

Strain Gages for Measuring Tension

Load cells, type P, for measuring forces or weights in tension only are announced by Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa. Load capacities of the cells are 10,000, 20,000, 50,000 and 100,000 lb. Other sizes will be made to order.

Load measurement is based on the use of SR-4 resistance wire strain gages bonded to a load-carrying shaft. The gages respond to infinitesimal stretch of the shaft under tensional load by a change in electrical resistance that varies the voltage. This change of voltage is measurable on a rugged, direct-reading dial indicator or a recorder of either the resistance potentiometer type or the sensitive micro-ammeter type. It may also be used to actuate relays for automatic control mechanisms. Electrical instrumentation may be located near or far away from the load sensitive element.

A single indicator may be used to obtain separate measurements from a number of load cells, if desired, or a load may be distributed among several cells whose combined output may be automatically totaled.

Accuracy of measurement is within ±¼ per cent of rated capacity. The cells are temperature and modulus compensated. Standard cells loaded to capacity for several weeks at room temperature varied a maximum of 0.1 per cent of the initial load without change in measuring performance. The cell is made relatively impervious to moisture and dirt by O-ring seals. External circuits can be protected by sealed conduits.

Applications include suspension of tanks and platforms, measurement of thrust carried in tension, engine dynamometers, portable weighing hoppers, and cable tension testing.

Hand Brake Conversion Unit

A conversion unit for modification of standard Ajax No. 1 hand brakes into stand-still wheel types has been announced by the Ajax-Consolidated Co., Chicago, Ill.

Rather than design and manufacture a completely new unit, Ajax-Consolidated felt that the basic design of its No. 1 brake which is almost universally standard on railroads could be modified to incorporate the stand-still wheel feature without making present installations obsolete.

The conversion unit is furnished on specifications to those desiring the stand-still wheel feature. The hand brake with this feature is Ajax No. 2.

INGERSOLL
INGERSOLL

NEWS

I.C.C. Seeks Locomotive Inspectors

ANNOUNCEMENT No. 284, issued March 27, 1951, by the U.S. Civil Service Commision, Washington 25, D.C., gives the locations, of positions, a description of the work, an outline of the personal and physical requirements, and other general information needed by applicants to qualify for examination for inspector of locomotives for duty in the Interstate Commerce Commission. The positions are rated at $5,400 a year (Grade GS-11).

Application Form 5000-AB may be obtained from any first- or second-class post office, except in cities where a United States Civil Service regional office is located; from the Civil Service Commission at Washington, and in the Panama Canal Zone from the Secretary, Board of United States Civil Service Examiners, Balboa Heights, C.Z.

No closing date has been set.

A.A.R. Mechanical Division Releases

JOURNAL BOXES— AIR BRAKE HOSE

Two A.A.R. Mechanical Division circulars, issued under date of March 7, contain the latest instructions about repacking journal boxes and conserving natural rubber in air brake and signal line hose. The circulars are reproduced practically in full for the benefit of car men who may not see or have a chance to study them in the original. Both circulars are signed by V. R. Hawthorne, executive vice-chairman of the division.

REPACKING JOURNAL BOXES

Effective January 1, 1951, Interchange Rule 66 was modified to provide more frequent periodic attention to journal boxes. At the same time new Par. (j-3) was added to Interchange Rule 3 to permit the receiving road to reject empty cars from owners having repack dates more than 15 months old.

These changes were made for the purpose of providing more frequent attention to the lubrication details on freight cars, particularly on the part of car owners with respect to their own equipment, with the view of reducing troublesome hot boxes.

In order to avoid rejection of empty cars from owners offered in interchange with the repack date more than 15 months old, all car owners should set up journal-box repacking programs at repair tracks and shops which will provide for repacking all of their own cars on the home line at the expiration of 12 months, particularly those which are nearing the 15-month limit.

Because of varying conditions on roads as to the percentage of owned cars away from the home line, it will be necessary for each road to repack the journal boxes on a total number of cars during each 12-month period, system and foreign, at least equivalent to its own car ownership. By so

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE APRIL ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of units*	*Horse-power*	*Service*	*Builder*
Chicago, Rock Island & Pacific	4	2,250	Passenger	Electro-Motive
Kansas City Southern	3[1]	1,500	Freight	Electro-Motive
Texas & Pacific	6[1]	1,500	Road switch	Electro-Motive
	8[1]	1,200	Switching	Electro-Motive
	8[1]	2,250	Passenger	Electro-Motive

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type*	*Builder*
American Refrigerator Transit Co.	500	40-ton refrigerator	Pressed Steel Car
Atchison, Topeka & Santa Fe	200	70-ton ballast	American Car & Fdry.
Atlantic Coast Line	6	50-ton air dump	Magor Car
Bangor & Aroostook	500[2]	40-ton refrigerator	Pacific Car & Fdry.
Canadian National	1,000	40-ton auto-box	Canadian Car & Fdry.
	100	30-ton flat	Canadian Car & Fdry.
Central of New Jersey	500	50-ton box	American Car & Fdry
Cudahy Packing Co.	50	40-ton refrigerator	Company shops
Chicago & Eastern Illinois	500	70-ton hopper	Pressed Steel Car
	500	50-ton hopper	Pressed Steel Car
Delaware, Lackawanna & Western	500	50-ton hopper	American Car & Fdry.
Grand Trunk Western	250	50-ton box	American Car & Fdry.
	250	70-ton hopper	American Car & Fdry.
	300	70-ton gondola	General American Trans.
	250	50-ton box	General American Trans.
Great Northern	1,000	70-ton ore	American Car & Fdry.
Kansas City Southern	500	70-ton hopper	Pullman-Standard
Lake Superior & Ishpeming	300[3]	70-ton ore	Bethlehem Steel
	100[3]	50-ton box	Pullman-Standard
Louisville & Nashville	100[4]	70-ton covered hopper	Pullman-Standard
Mather Stock Car Co.	50	40-ton refrigerator	Company shops
Minneapolis, Northfield & Southern	100[5]	50-ton box	Pullman-Standard
Missouri Pacific	100	50-ton pulpwood	Company shops
New York Central	1,000	70-ton gondola	Greenville Steel Car
	500	70-ton flat	General American Trans.
Pittsburgh & Lake Erie	1,000	70-ton gondola	Bethlehem Steel
Northern Pacific	1,000[6]	50-ton box	Company shops
	200	70-ton ore	Company shops
	50	Caboose	Company shops
Pennsylvania	250	70-ton covered hopper	Company shops
Southern Pacific	500	70-ton ballast	American Car & Fdry.
	100	70-ton gondola	Greenville Steel Car
Texas & Pacific	250[7]	70-ton gondola	Company shops
Virginian	300[8]	50-ton box	Pullman-Standard
Western Maryland	1,000	55-ton hopper	Bethlehem Steel
	70	70-ton flat	Greenville Steel Car

FREIGHT-CAR INQUIRIES

Baltimore & Ohio	1,000	70-ton gondola	
	1,000	50-ton box	
	500	70-ton covered hopper	

PASSENGER-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Lehigh Valley	2[9]	Rail diesel (RDC-2)	Budd Co.
Pennsylvania	64[10]	Passenger	Budd Co.

[1] With delivery of this motive power, all regular passenger trains on the system and all regular freight train operations west of Shreveport, La., will be dieselized, as well as all switching operations at important points in Texas and Louisiana.

[2] Delivery scheduled for the fourth quarter of 1951. Estimated cost, $4,500,000.

[3] The ore cars, to cost $1,740,000, are scheduled for delivery in August, 1952; the box cars, to cost $560,000, are scheduled for delivery in the second quarter of 1952.

[4] Approximate cost, $690,000. Delivery scheduled for mid-1952.

[5] Estimated cost, $560,000. Delivery scheduled for the third quarter of 1952.

[6] All cars to be completed in 1952. Delivery of materials will determine order in which cars are to be built.

[7] To be built in 1952.

[8] Estimated cost, $1,700,000. Delivery expected in the second quarter of 1952.

[9] Approximate cost, $300,000. The cars are scheduled to be placed in service late this summer between Hazelton, Pa., and Lehighton.

[10] These cars, for completely re-equipping the "Congressional" and the "Senator," will provide two 17-car trains between New York and Washington for the "Congressional" and two 15-car trains for the "Senator" for the Washington-Boston service. The "Congressional" equipment will include a new type parlor car with seven private rooms, each accommodating five passengers, designed for conferences or family groups. These trains will accommodate 827 passengers and provide dining facilities for 112 in a full-length twin-unit dining car, and in a coffee-shop car for coach passengers. There will be a mid-train lounge and an observation lounge car for Pullman passengers. Each set of equipment for the "Senator" will accommodate 767 passengers with dining and coffee shop accommodations for 92. The new cars are to be built "as rapidly as possible."

NOTES:

Chicago, Rock Island & Pacific.—The Rock Island has been authorized by its board of directors to purchase 46 diesel-electric locomotive units costing more than $7 million. With delivery of these units, the Rock Island said it will be "approximately 100 per cent dieselized." To be ordered are: Six 2,250-hp. passenger, 15 1,500-hp. double-control suburban service, and 25 1,500-hp. general-purpose units.

Star of NATIONAL TRADE-MARK standardized brushes

AZY

THE BRUSH GRADE FOR DIESEL-ELECTRIC TRACTION MOTORS

Broken brushes . . . . NO!

Shunt failures . . . . . NO!

Fine commutators . . YES!

plus SUPERB BRUSH LIFE!

● These statements are *facts.* Grade AZY brush is better than any brush ever applied to diesel-electric traction motors as proved by twelve million miles of rugged, on-the-job testing. Never before has there been a grade – GRADE AZY – combining physical strength with long life at high speeds without commutator wear.

This brush has a special, no-fray shunt cable. It has a unique, vise-tight shunt connection.

This brush is it, and you can get it, under National's unique standardization program, for the same low, flat price, whether you buy 1 box or 10,000 boxes. You get the best brush money can buy and you save money in the bargain. For complete information, write to National Carbon Company, A Division of Union Carbide and Carbon Corporation.

The terms "National", "Plytek" and "Eveready" are registered trade-marks of

NATIONAL CARBON COMPANY

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street, New York 17, N. Y.

District Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

SLASH BATTERY COSTS IN HALF!

With the revolutionary new "Eveready" No. 1050 Flashlight Battery, you get these big exclusive features:

- More than twice as much light
- Whitest, brightest light available from a flashlight battery
- Half the cost for light output
- Leakproof – No metal can to leak or corrode
- Will not swell, stick or jam in a flashlight

Why? Because of "Eveready" No. 1050's exclusive "inside out" construction. Instead of being the container for the cell, the zinc electrode is on the inside to make the battery last longer, while the new outside carbon jacket makes the battery leakproof. *Order a supply of No. 1050's today.*

doing, there will eventually be but few cars in operation having journal boxes long overdue for repacking.

Unless the packing is in bad condition, loaded cars having journal boxes overdue for periodic attention should not be shopped solely for the purpose of repacking boxes, it being preferable to concentrate on empty cars.

The full cooperation of all car owners in this matter is earnestly requested, so as to insure fast operation of freight trains which are carrying all kinds of material of extreme importance at this time.

Emergency Specifications EM-601-51

The National production Authority of the U. S. Department of Commerce has placed controls on the consumption of new rubber in order to conserve the supply of rubber for the needs of national defense. The N.P.A.—M-2 contains provisions limiting the total new rubber and also limits the consumption of natural rubber. The need for greater use of synthetic and reduced use of natural rubber is immediate.

This matter has been considered jointly by the representatives of the Rubber Manufacturers' Association and the Committee on Specifications for Materials of the Mechanical Division. As a result of this consideration, a new emergency revision of Specification M-601 has been approved and is effective immediately.

Revision of other rubber goods specifications of the division is in course of preparation and emergency specifications will be issued shortly covering all of the specifications now shown in the 600 series in Sec. A of the Manual of Standard and Recommended Practice, except for air brake hose gaskets, for which specifications it is hoped there will be no necessity for any change. Every effort is also being made to preserve the present specifications of the manufacturers for gaskets used in air brake valves as well as in hose.

Truck Side Failures

In a circular dated March 21, the A.A.R. Mechanical Division again calls attention to the need for most careful inspection of cast-steel truck side frames before assembling in trucks ready for service. The specific suggestions advanced are to make sure that:

1—All secondhand truck side frames cast during and prior to 1926 and available for reapplication to interchange cars have been normalized, inspected and stamped as defined by current A.A.R. Interchange Rule 3, page 26.

2—Truck side frames in stock are stored in a manner which will prevent the accumulation of rust and corrosion, thus avoiding deterioration leading to possible future failures in service.

3—Where drain holes in bottom section of truck side frames on and off cars are found to be stopped up, the holes are reopened and the accumulated moisture and foreign matter cleaned out in order to avoid further deterioration by reason of corrosion.

Maintenance of Air Brakes

Air-brake Instruction Pamphlet No. 5039-4, Sup. 1, which governs the use of the single-car testing device, provides that the device arrangement must include a suitable feed valve in the air-supply line for the purpose of providing a constant air pressure during the various tests, also an efficient air filter in the supply line ahead of the feed valve.

In this connection, current reports from the A.A.R. Mechanical Inspection Department continue to show that many devices are in service though not yet equipped with the feed valve or the filter, or both. The A.A.R. Mechanical Division requests in a circular dated March 21 that immediate inspection be made of all single-car testing devices now owned, and that early necessary adjustments be made in accordance with standard requirements.

Gas-Turbine Locomotive Progress Reported

Substantial progress in the development of gas-turbine locomotives for American railway service was reported at the Midwest Power Conference sponsored by the Illinois Institute of Technology in co-operation with the other schools and technical societies in the middle west and held at Chicago April 4 to 6, inclusive. At the afternoon session on April 6, presided over by J. T. Rettaliata, dean of engineering of the Institute, four speakers included J. I. Yellot, director of research, Locomotive Development Committee, Baltimore, Md.; Alan Howard, Gas-Turbine Engineering division, General Electric Company, Schenectady, N. Y.; T. J. Putz, manager, Locomotive and Gas-Turbine Engineering, Westinghouse Electric Corporation, Philadelphia, Pa., and W. B. Tucker, Turbo

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

Freight Service (Data from I.C.C. M-211 and M-240)

Item No.		Month of December 1950	Month of December 1949	12 months ended with December 1950	12 months ended with December 1949
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	28,693	29,704	346,515	390,869
3-06	Total, Diesel-electric	20,025	15,066	211,799	152,954
3-07	Total, electric	793	791	9,880	9,524
3-04	Total, locomotive-miles	49,511	45,561	568,260	553,371
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,709	1,435	19,633	17,854
4-06	Empty, total	812	869	10,139	10,154
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	47,097	45,552	577,555	611,875
6-02	Total in oil-burning steam locomotive trains	12,370	11,831	154,174	175,425
6-03	Total in Diesel-electric locomotive trains	55,102	42,031	598,948	435,635
6-04	Total in electric locomotive trains	2,122	2,097	26,351	25,539
6-06	Total in all trains	116,697	101,517	1,357,340	1,248,609
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.05	1.05	1.05	1.05
10-02	Loaded freight car-miles	38.60	35.30	38.60	36.20
10-03	Empty freight car-miles	18.30	21.30	19.90	20.60
10-04	Total freight car-miles (excluding caboose)	56.90	56.60	58.50	56.80
10-05	Gross ton-miles (excluding locomotive and tender)	2,634	2,494	2,669	2,534
10-06	Net ton-miles	1,233	1,110	1,224	1,138
12	Net ton-miles per loaded car-mile (M-211)	32.00	31.50	31.70	31.40
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	67.80	62.30	65.90	63.70
14	Averages per train hour (M-211):				
14-01	Train miles	16.60	17.10	16.80	16.90
14-02	Gross ton-miles (excluding locomotive and tender)	43,139	41,994	44,353	42,346
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	44.40	41.20	45.20	41.90
14-02	All	42.30	38.30	42.50	39.40
15	Average net ton-miles per freight car-day (000) (M-240)	915	752	888	788
17	Per cent of home cars of total freight cars on the line (M-240)	35.90	50.10	40.80	50.00

Passenger Service (Data from I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	13,139	14,757	141,521	184,580
3-06	Diesel-electric	15,948	14,032	176,722	153,232
3-07	Electric	1,780	1,751	19,385	19,862
3-04	Total	30,867	30,539	337,629	357,788
4	Passenger train car-miles (000):				
4-08	Total in all locomotive-propelled trains	302,159	294,497	3,257,835	3,366,728
4-09	Total in coal-burning steam locomotive trains	74,086	79,263	740,281	967,839
4-10	Total in oil-burning steam locomotive trains	39,271	42,101	442,711	521,720
4-11	Total in Diesel-electric locomotive trains	170,209	153,888	1,866,810	1,659,387
12	Total car-miles per train-miles	9.71	9.47	9.47	9.22

Yard Service (Data from I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,436	1,511	17,101	20,546
1-02	Steam, oil-burning	266	244	3,023	3,265
1-03	Diesel-electric[1]	2,850	1,280	30,441	24,064
1-06	Total	4,580	4,063	50,894	48,190
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	67	83	701	1,066
2-02	Steam, oil-burning	15	14	164	183
2-03	Diesel-electric[1]	262	240	2,776	2,536
2-06	Total	381	374	4,054	4,206
3	Hours per yard locomotive-day:				
3-01	Steam	8.05	7.60	8.10	8.10
3-02	Diesel-electric	17.90	17.50	17.50	17.20
3-05	Serviceable	14.60	13.80	14.20	13.30
3-06	All locomotives (serviceable, unserviceable and stored)	12.70	11.30	12.10	11.10
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.84	1.95	1.79	1.87
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.78	0.79	0.77	0.78

[1]Excludes B and trailing A units.

The Lackawanna "Phoebe Snow"

Spicer Generator-Drive Equipped

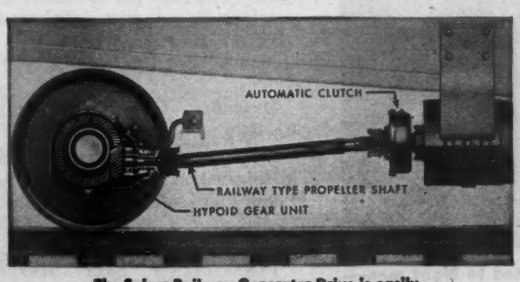
● Your first glimpse of one of the air-conditioned PHOEBE SNOW coaches will reveal a whole new array of comforts and conveniences: wide vista windows . . . individual reclining seats . . . oversized luggage racks . . . fluorescent lights . . . circulating ice-water . . . individual vanity tables in the women's lounge.

For sociability and relaxation, THE PHOEBE SNOW offers a smart new Observation-Lounge Car with deep-cushioned club chairs facing the large picture-windows—and with a separate Tavern section and Refreshment Bar.

The handsomely appointed new Dining Car of THE PHOEBE SNOW, with its wide panoramic windows, Venetian blinds and colorful drapes, provides a perfect setting for those delicious home-style meals for which the Lackawanna long has been famous.

For overnight travel between New York and Chicago, the westbound PHOEBE SNOW carries a modern, *all-private-room* Sleeping Car, containing 10 roomettes for single occupancy and 6 double bedrooms. Features of these rooms include individual controls for lighting, heating and air-conditioning . . . wardrobe and shoe lockers . . . full-length mirrors . . . and many other conveniences.

An imposing list of America's crack trains and streamliners rely upon Spicer equipment for electrical service of the highest efficiency. Write for literature giving complete details of the Spicer Railway Generator Drive.



The Spicer Railway Generator Drive is easily adaptable to old and new equipment

47 YEARS OF **Spicer** SERVICE

The Spicer Railway Generator Drive is manufactured, sold and serviced by

SPICER MANUFACTURING
Division of Dana Corporation
TOLEDO 1, OHIO

Power Development department, Allis-Chalmers Manufacturing Company, Milwaukee, Wis.

Mr. Yellott said that experience to date indicates the goal of a practicable coal-fired gas-turbine locomotive is attainable and credited much of the success of recent tests to F. D. Buckley, manager, Research and Development division, Locomotive Development Committee Project, American Locomotive Company, Dunkirk, N. Y. Mr. Tucker showed how objectionable exhaust noise has been overcome in the Allis-Chalmers gas-turbine power unit. Mr. Howard described the progress to date with tests of the G.E. gas-turbo-electric locomotive on the Union Pacific which ordered 10 units of the same general type. Mr. Putz brought members up to date on the status of the Baldwin-Westinghouse gas-turbo-electric locomotive now in experimental general service on the Bessemer & Lake Erie.

R. V. Wright Essay Contest

The 1951 Roy V. Wright memorial essay contest of the New York Railroad Club involves $1,500 in prizes—one of $500 and 10 of $100 each—for the 11 best essays on the subject "Essential provisions of an adequate national transportation policy."

Although the designated subject was chosen because, as the announcement said, "there is probably no other transportation question to which the right answer, if made effective, would benefit so many people," contestants may write on other subjects. Those wanting to develop another topic are asked to get approval from C. T. Stansfield, executive secretary of the club, 30 Church Street, New York 7, to whom essays and other correspondence about the contest should be addressed. Completed essays must reach Mr. Stansfield no later than next October 1.

Essays in the contest, which is named for the late editor of the *Railway Mechanical and Electrical Engineer*, should be not less than 2,500, nor more than 7,000 words long. To be considered for prizes essays must contain internal evidence that the writer has familiarized himself with two books entitled "National Transportation Policy," by C. L. Dearing, and Wilfred Owen, and "Transportation Conditions and National Transportation Policy," 15 pamphlets containing testimony of railroad industry witnesses before the Senate Committee on Interstate and Foreign Commerce and published by the Association of American Railroads.

Miscellaneous Publications

ALUMINIZED STEEL.—Armco Steel Corporatin, Middletown, Ohio. 24-page booklet, "Armco Aluminized Steel." Describes the steel's aluminum surface, its heat and corrosion resistance, and outstanding heat reflectivity—80 per cent up to 900 deg. F. Applications in a wide variety of products illustrated or listed. Includes also data on mechanical and forming properties, available sizes and gages, and detailed recommendations for welding by various methods, brazing and finishing.

◆

PRINCIPLES OF CENTERLESS GRINDING.—Cincinnati Grinders, Incorporated, Cincinnati 9, Ohio, 48-page, paper-bound booklet; illustrated. Intended to explain the several principles of centerless grinding which are entirely different from center-type grinding. Its nine chapters cover the basic design of a centerless grinding machine; methods and advantages of centerless grinding; work blades; wheels; truing the wheels; corrective adjustments—thrufeed and infeed work; how to economically grind small lots on a centerless; typical examples, and tables for estimating production of thrufeed work.

SUPPLY TRADE NOTES

TIMKEN ROLLER BEARING COMPANY.—*Paul Reeves* has been appointed director of sales of the Timken Company.

Mr. Reeves attended Staunton Military Academy and is a graduate of Carnegie Institute of Technology with a degree in Mechanical Engineering. He became associated with Timken in 1929 and after completing the engineering training course, served as sales engineer in the company's Chicago office. He was subsequently transferred to the San Fancisco, Cal., branch office where he was industrial district manager. In 1940 Mr. Reeves returned to the home office in Canton, Ohio, as sales promotion manager but when this country entered the war, he was put in charge of government priorities to handle contacts between the company and Washington. He was appointed advertising manager in 1943.

◆

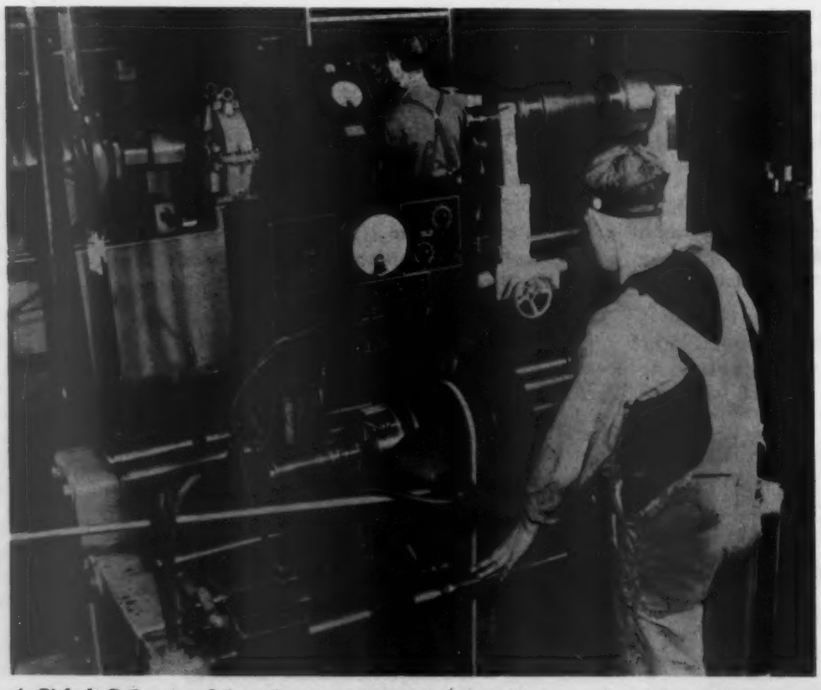
QUAKER RUBBER CORPORATION.—*J. R. Lewis* has been appointed assistant general sales manager of the Quaker Rubber Corporation, a division of the H. K. Porter Company. Mr. Lewis has been with Quaker since 1940, working successively as Philadelphia, Pa., district sales manager and assistant sales manager.

◆

DEARBORN CHEMICAL COMPANY.—The Chicago offices of the Dearborn Chemical Company have been moved from 310 South Michigan avenue to the Merchandise Mart Plaza, Chicago 54.

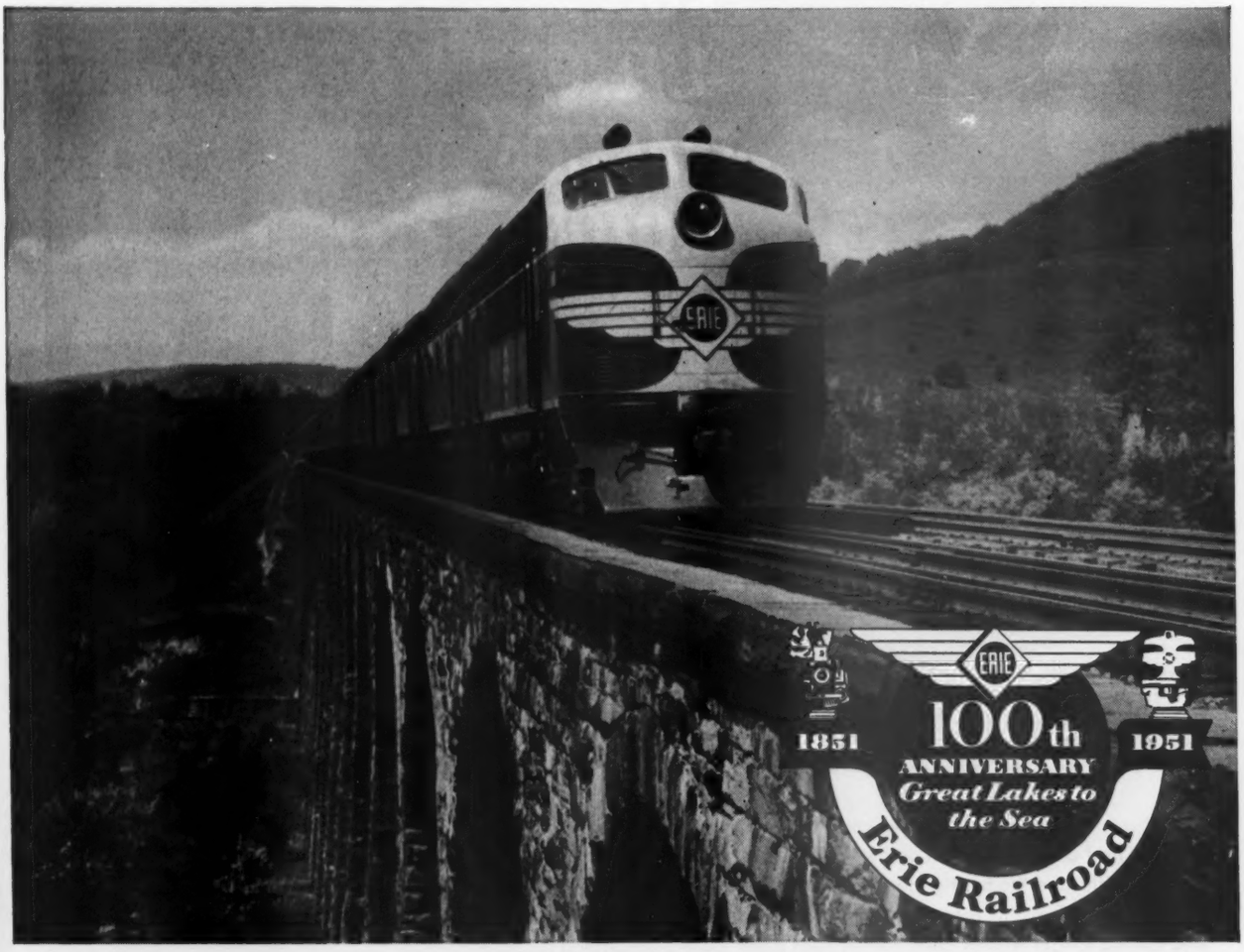
◆

PENNSYLVANIA SALT MANUFACTURING COMPANY.—The Pennsylvania Salt Manufacturing Company has formed a new sales department to serve industry and business



A Gisholt Balancing School has been inaugurated with classes limited to eight men—Lecture and discussion groups are supplemented by practical "on the job" instruction in balancing Diesel and electrical parts on equipment, as illustrated, at the plant, Madison, Wis.

Esso Standard Oil Company Salutes the Erie Railroad...



in Partnership with Service and Progress for 100 Years

This month the Erie Railroad passes an outstanding milepost... its 100th Anniversary. This century of service is a truly great accomplishment... a record of constant enterprise and continuing development... a history of progress and public service. Congratulations to the Erie on a job well done!

The Esso Standard Oil Company is proud that dependable, high-quality Esso Railroad Fuels and Lubricants are being used by the Erie. Our continuing aim is to serve the needs of railroading with products that are "tailor made" to railroad specifications.

The Sign of QUALITY — Esso — The Symbol of SERVICE

RAILROAD PRODUCTS

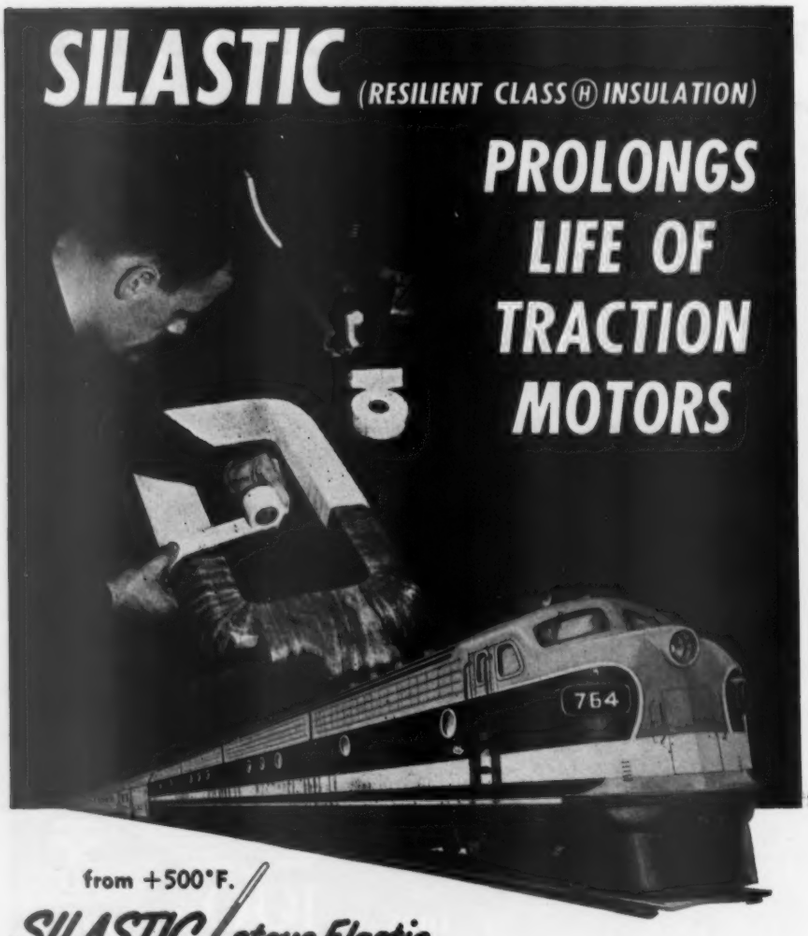
SOLD IN: Maine, N. H., Vt., Mass., R. I., Conn., N. Y., N. J., Penna., Del., Md., D. C., Va., W. Va., N. C., S. C., Tenn., Ark., La.

ESSO STANDARD OIL COMPANY — Boston, Mass. — New York, N. Y. — Elizabeth, N. J. — Philadelphia, Pa. — Baltimore, Md. — Richmond, Va. — Charleston, W. Va. — Charlotte, N. C. — Columbia, S. C. — Memphis, Tenn. — New Orleans, La.

Esso Railroad Products are backed by constant research and follow-up

SILASTIC (RESILIENT CLASS (H) INSULATION)

PROLONGS LIFE OF TRACTION MOTORS



from +500°F.

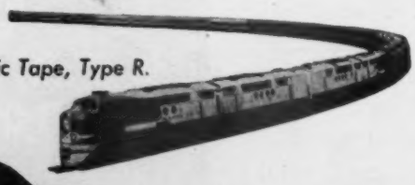
SILASTIC stays Elastic

to −100°F.

Now, for the first time since Benjamin Franklin tied a key to the tail of a kite, there's a rubbery insulating material that will withstand the heat generated in an overloaded motor. Available as Silastic Tape, Type R, these new insulating materials are easier to apply and form a longer lasting outer jacket than other kinds of insulation suitable for traction motor field coils.

Silastic Tape, Type R, vulcanizes to form a continuous void-free jacket that is moisture proof, stable and resilient at top Class H operating temperatures (180° C.), and highly resistant to oil and to both mechanical and electrical fatigue. Over 4200 main and interpole field coils insulated with Silastic Tape, Type R, are now in service on diesel-electric traction motors.

Many of these coils have been in service for more than 15 months with no failures reported even in the case of one locomotive that was suddenly thrown into reverse by a short circuited control panel. The cost is comparable to Class B coils; life expectancy is in the range of 10 to 1.



Write now for data on Silastic Tape, Type R.

DOW CORNING CORPORATION
MIDLAND, MICHIGAN

DOW CORNING SILICONES

Atlanta • Chicago • Cleveland • Dallas • Los Angeles • New York • Washington, D. C.
In Canada: Fiberglas Canada Ltd., Toronto • In Great Britain: Midland Silicones, Ltd.

in maintenance work including heavy duty cleaning of railroad equipment. The department, designated as the Maintenance Chemicals department, is headed by *Horace F. McIntyre*, a member of the Pennsalt organization since 1943 and formerly a sales representative, district sales manager

H. F. McIntyre

and then product supervisor in the Special Chemicals department. To the Maintenance Chemicals department has been assigned all sales and service work on Pennsalt products for maintenance, as differentiated from products used in manufacturing processes. Thus, Pennsalt's specialties for maintenance of railroad equipment, formerly handled by the Special Chemicals department, have been assigned to the new department.

◆

BULLARD COMPANY.—*Frank U. Hayes*, sales manager of the Bullard Company, Bridgeport, Conn., has been elected vice-president. Mr. Hayes, during his 16 years

F. U. Hayes

with the company, has served in numerous capacities from the manufacturing phases up to his present status as vice-president and sales manager.

◆

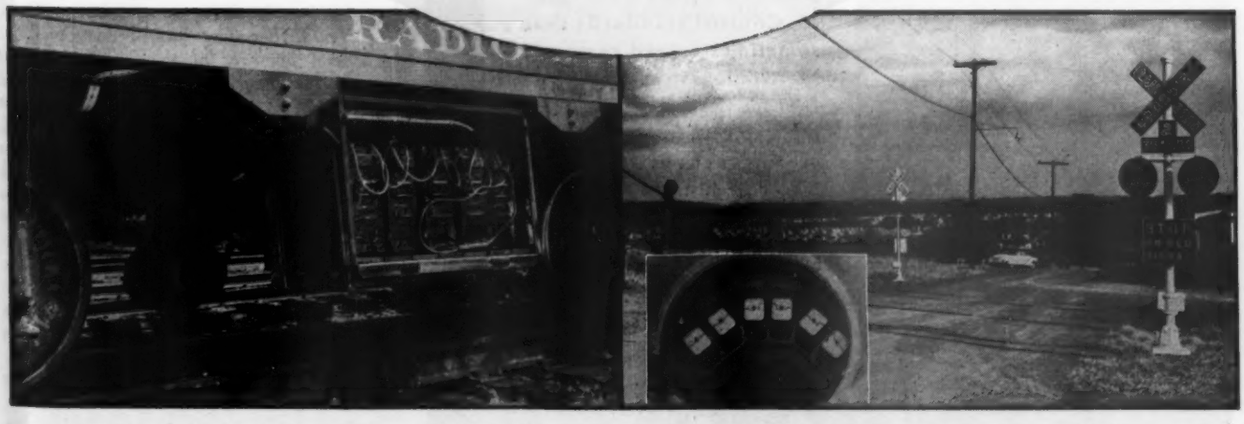
FAIRBANKS, MORSE & CO.—*V. H. Peterson*, manager of the railroad division of Fairbanks, Morse, has been elected vice-president in charge of railroad sales.

Mr. Peterson has been with Fairbanks, Morse & Co., since May of 1946. Prior to that time he was associated with the

This year marks the centennial of the completion of the New York and Erie Railroad, now the Erie, from Piermont on the Hudson River to Dunkirk on Lake Erie which provided the first rail connection "from the Great Lakes to the Sea."

Today the Erie is a major trunkline in the East; extends all the way from the Port of New York to Chicago; serves "The Heart of Industrial America"; gives employment to 20,000 people; continually improves its capacity for service, its investment for improvements having amounted to $90,000,000 in the past 5 years.

Among these recent improvements was the adoption of radio train-communication and centralized traffic control. Our company is proud to have assisted the Erie in its application of electric power to these improvements as well as to earlier advancements including the lighting and air conditioning of passenger-train cars, the installation of automatic and highway crossing signals and many other signaling functions, two of which are illustrated here.



These caboose batteries were installed in 1948 after 22 to 25 years of car-lighting service.

Edison Primary Batteries serve as stand-by power source for many Erie highway crossing signals.

THOMAS A. EDISON, INCORPORATED

Storage Battery Division • *Primary Battery Division*

WEST ORANGE, N. J. • **BLOOMFIELD, N. J.**

IT PAYS TO GO TO A GOOD TAILOR!
STACKPOLE
Because they're sold only to original equipment Diesel manufacturers, Stackpole brushes are fitted *exactly* to *specific* characteristic requirements. Each "fitting" is backed by almost a third of a century of "tailor-made" brush experience. Each brush is produced under Quality Control standards that sometimes exceed customer specifications in exactness.
That's why it pays to buy replacements from the Diesel manufacturer who uses Stackpole brushes as original equipment—*as leading Diesel makers do!*
STACKPOLE CARBON COMPANY
St. Marys, Pa.
STACKPOLE
Diesel-Electric
BRUSHES

Baldwin Locomotive Works as assistant to the president and manager of Baldwin's New York office. After receiving his education in the public schools of Waterbury, Conn., Mr. Peterson first went to work as a draftsman for the Scovill Manufacturing Company of Waterbury. Through a scholarship he entered Rensselaer Polytechnic Institute at Troy, N.Y., where he received,

V. H. Peterson

a degree in mechanical engineering in 1925. He then entered the service of the Elliott Company, being engaged, successively, as sales engineer in the Pittsburgh, Pa., office and district manager of the Rochester, N.Y., and Washington, D.C., offices. In 1938 he went to Jeannette, Pa., as assistant to the president, where he coordinated the company's sales activities. Three years later he was elected a vice-president, with responsibility for all sales, advertising and service activities of Elliott's three plants In 1934 he became assistant to the president of Baldwin. He joined Fairbanks Morse in 1946 as manager of eastern sales, with headquarters at New York and shortly thereafter became manager of the combined diesel locomotive and railroad divisions at Chicago.

◆

BALDWIN-LIMA-HAMILTON CORPORATION. —*Henry Barnhart* has been appointed general manager of the Lima plant and *J. F. Connaughton* as assistant general manager of the Lima-Hamilton division of the Baldwin-Lima-Hamilton Corporation, Lima, Ohio. Mr. Barnhart, also a vice-president, has been associated with Baldwin-Lima-Hamilton and predecessor companies since 1928. He was appointed general sales manager in 1936 and vice-president in 1944. Mr. Connaughton, also special assistant to *Walter A. Rentschler*, vice-president in charge of the division, has likewise been with the corporation since 1928.

The corporation has closed its offices at 120 Broadway, New York. All sales activities in the New York area will be coordinated in the company's offices at 60 E. 42nd street, New York.

◆

TURCO PRODUCTS, INC.—*L. H. Moulton*, vice-president and national sales director of Turco Products, has retired. *D. T. Buist* succeeds Mr. Moulton as national sales director. *Stewart B. Van Dyne* has been

MORE AMPERES CAN RIDE THESE CABLES

You can do yourself and our country a service by installing Simplex-ANHYDREX XX Cables wherever you need to replace high voltage power cable.

Here's why. You can crowd more amps into the same size copper when it is insulated with Simplex-ANHYDREX XX. That's how you save copper. Of course your cables will run hotter but that's all right with Simplex-ANHYDREX XX insulation. This insulation is built to withstand 75°C. to 80°C. (167°F. to 176°F.), depending on operating conditions.

Simplex-ANHYDREX XX Insulated Cables can be used underground, directly in the earth, or in ducts, or they can be used overhead as aerial cables. The special Simplex neoprene jacket protects these insulated conductors from sunlight, oil, acids, alkalies, etc.

Want to know more about this versatile high temperature, high voltage power cable insulation that really combats moisture and water? Then return the coupon. No obligation, of course.

Simplex-ANHYDREX XX is a product of Simplex Research

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

SIMPLEX WIRE & CABLE CO.
79 SIDNEY ST., CAMBRIDGE 39, MASS.
GENTLEMEN: PLEASE SEND A COPY OF BOOKLET 1009A TO:
NAME_____ TITLE_____
COMPANY_____
STREET_____
CITY_____ STATE_____

FOR YOUR MANY
"GREASE CHASING" Jobs
stock
SUPER MAGNUSOL

Where there's greasy, oily dirt to remove . . . put Super Magnusol to work. It cleans in record time, without costly "elbow grease," and with complete safety for all surfaces.

- Save $10 to $12 per engine room every time you clean. Just spray on a mixture of one part Super Magnusol and six parts safety solvent, and let it soak in. Then flush off with water. You clean engine surfaces and all the floor area by the same method.
- Use the same mixture for cleaning out engine pits. Super Magnusol takes the "cling" out of greasy dirt, whatever it is.
- Clean greasy concrete floors by the same method. There is no danger of fire when you use Super Magnusol. No fumes . . . no toxicity.
- Clean engine trucks and underbodies with the Super Magnusol solution. Just spray it on and flush it off.

There are a number of ways you can convince yourself as to the job Super Magnusol can do for you. We'll gladly send a Magnus representative to give you a demonstration. You can have a supply to try out yourself on the Magnus 30-Day Trial Basis. You can ask us for the names of railroads now using Super Magnusol, and see what they think of it. The main point is—it's worth looking into!

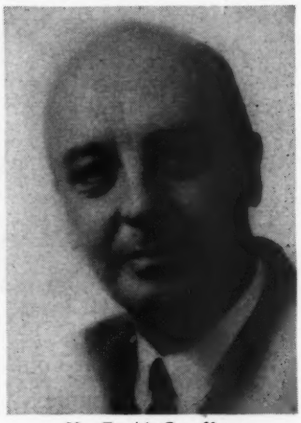
Railroad Division
MAGNUS CHEMICAL COMPANY • 77 South Ave., Garwood, N. J.
In Canada—Magnus Chemicals, Ltd., Montreal

Magnus CLEANERS
AND
CLEANING EQUIPMENT
Representatives in all principal cities

appointed administrative assistant, *D. T. Miller* coordinator of sales. The latter are newly-created positions. *J. Hart* has been appointed manager of the Metal Processing Sales division. Mr. Hart will act as special sales representative and technical advisor to the metal processing and general manufacturing fields.

◆

SIMMONS-BOARDMAN PUBLISHING CORPORATION.—*Herbert E. McCandless*, vice-president in charge of circulation for the



H. E. McCandless

Simmons-Boardman Publishing Corporation, has retired. Mr. McCandles was born on January 18, 1890, in New York City, where he began his business career in 1905 in the banking field. From 1911 to 1917 he was associated with a New York public utility company. He served in the United States Army from late 1917 to 1919. Mr. McCandless joined Simmons-Boardman in 1920 and in 1928 was appointed assistant to the president in charge of circulation. He was elected a vice-president in August, 1943.

◆

GENERAL STEEL CASTINGS CORPORATION.—*Pierre O. Wood*, sales engineer for General Steel Castings Corporation, has been appointed assistant manager of service, with offices at Granite City, Ill.

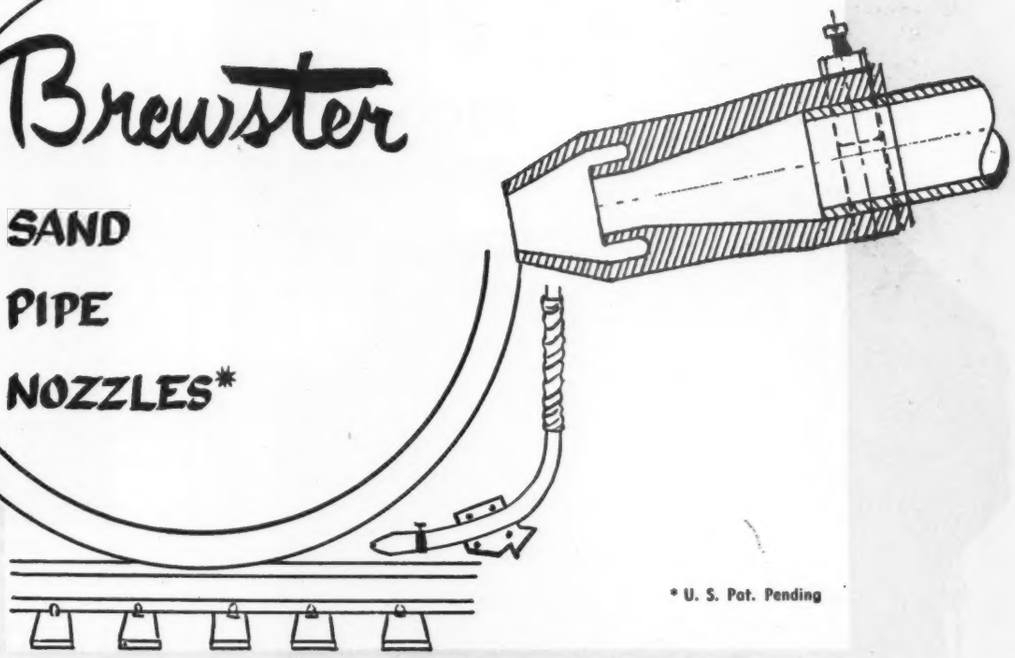
After receiving his B. S. degree in mechanical engineering at Purdue University,

Pierre O. Wood

Mr. Wood worked in the shops of the St. Louis-San Francisco, completing an ap-

Brewster

SAND PIPE NOZZLES*



* U. S. Pat. Pending

Now in use by leading railroads

1 — *DIRECTS SAND to point of contact*

2 — *MINIMUM sand flow*

3 — *FEWER sand box refills*

4 — *BETTER adhesion between wheel and rail*

5 — *NO WATER can enter pipe by capillary attraction*

6 — *SIZES TO FIT both 1" or 1¼" pipe*

PLEASE SPECIFY:

No. 888-1 — for application to 1" delivery pipes

No. 888-1¼ — for application to 1¼" delivery pipes

MORRIS B. BREWSTER CO., INC.

8 SOUTH MICHIGAN AVENUE • CHICAGO 3, ILLINOIS

"Buffalo" DOUBLE END ANGLE and BAR SHEAR

TO BREAK THAT PRODUCTION BOTTLENECK

THIS 1 RUGGED MACHINE

- CUTS ROUNDS UP TO 4⅜"
- CUTS SQUARES UP TO 4"
- SHEARS UP TO 8 x 1⅛" ANGLES
- SHEARS UP TO 6 x 2½" FLATS

. . . as well as beams, channels and other structurals, using suitable knives. Here is a fast, versatile machine to keep the fabrication end of your production moving! And you can "push" it for years and years—its electrically welded steel frame gives it lasting rigidity and strength. Five sizes to choose from. WRITE FOR BULLETIN 310-C.

BUFFALO "FORGE" COMPANY
174 Mortimer St. Buffalo, New York
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING

prenticeship as machinist. He joined General Steel Castings in January, 1929, as an inspector at its Commonwealth plant, later serving in the engineering and sales departments. In 1936 he became service engineer, and in 1945 returned to the sales department as sales engineer.

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*Ellis W. Test*, assistant to president of Pullman-Standard Car Manufacturing Company, has retired.

Mr. Test received his engineering degree from the University of Michigan in 1906,

Ellis W. Test

when he began his career as a shop apprentice and draftsman on small railway cars with Fairbanks, Morse & Co., at Three Rivers, Mich. He was associated with the Haskell & Barker Car Co., prior to that company's acquisition by the Pullman Company in 1922, at which time Mr. Test came to Chicago as assistant to the vice-president. Later he also served as chief engineer, and in 1924 when Pullman became Pullman Car & Manufacturing Corp., he continued as assistant to vice-president. He was appointed assistant to president of Pullman Standard Co. in 1935.

◆

GENERAL MOTORS CORPORATION.—*Frank U. Naughton, Jr.*, has been appointed manager of the Eastern sales division of the *Hyatt Bearings division* of General Motors, to succeed the late W. L. Iliff. Mr. Naughton has been sales engineer for Hyatt since 1924, serving in the Philadelphia, Pa., New England and southeastern territories.

◆

WESTINGHOUSE ELECTRIC CORPORATION.—*H. Raymond Benson*, formerly New England district maintenance supervisor of the Westinghouse Electric Corporation, has been appointed manager of the transportation department, at district headquarters in Boston, Mass.

Mr. Benson, an electrical engineering graduate of Northeastern University, joined the transportation sales department of Westinghouse in the New England district in 1924. He was appointed district maintenance supervisor in 1939.

◆

AIR REDUCTION COMPANY.—The Air Reduction Company will construct a new plant at Calvert City, Ky., costing upwards of

FOR DIESEL LOCOMOTIVE WHEELS

Improved boring, hub turning and facing

Designed with full automatic boring cycle from loaded start to stop, and supplementary manual operation at any point in the automatic cycle. Its wide speed range is suitable for either carbide or high speed steel tools.

BETTS Hydraulic Feed DIESEL WHEEL BORER

(Patents Pending)

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

This modern machine bores diesel locomotive wheels up to 48" tread diameter, and passenger or freight car wheels down to 30" tread diameter. The hydraulically operated side head, for turning and facing the hubs, has feed and rapid traverse vertically and horizontally with supplementary hand feed. Write for complete information on this advanced machine designed to reduce costs while speeding up wheel production.

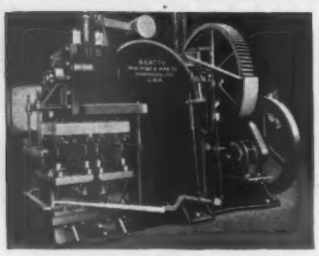
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

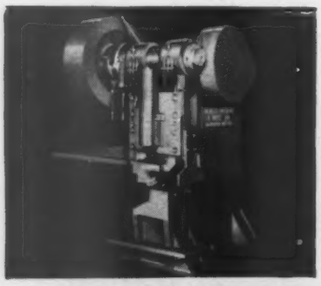


BEATTY No. 11-B Heavy Duty Punch widely used in railroad industry.

YOU NAME the problem

WE'LL BUILD the answer

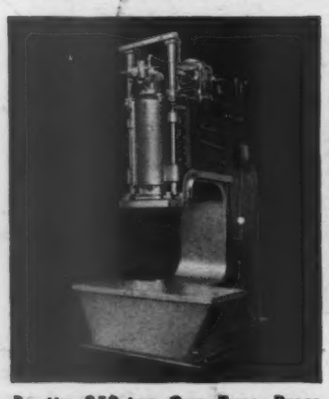
Beatty Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.



Beatty Single End Bar Shear available in capacities up to 300 ton.

If you have a heavy metal working problem, the odds are that a BEATTY engineer can provide the answer. That's true because BEATTY engineers have designed and built so many special machines that no problem is completely new to them.

Our experience in many fields qualifies us to design and build heavy metal working tools that will speed your production, reduce your fabricating costs. There is a better way to handle most production problems, and our specialty is to help you find that better way.



Beatty 250-ton Gap Type Press for forming, bending, flanging, pressing.

$10,000,000. Construction will begin next July 1 and operations are expected to start by January 1, 1953. The new plant will be operated by the *National Carbide Company*, under direction of *Russell T. Lund*, operations manager of Carbide's Louisville, Ky., Keokuk, Iowa, and Ivanhoe, Va., plants

◆

NATIONAL MALLEABLE & STEEL CASTINGS CO.

DONALD F. KITTREDGE has been appointed manager of sales, Railway division, of the National Malleable & Steel Castings Co., with headquarters at New York. He succeeds ELLSWORTH H. SHERWOOD, whose election as assistant vice-president, sales, Railway division, was announced in the March issue.

Obituary

EARL A. AVERILL, at one time managing editor of the Railway Age Gazette, Mechanical Edition (now the Railway Mechanical and Electrical Engineer), died on Tuesday, April 3. Mr. Averill was born at Richland, N.Y., on August 13, 1878. In 1900 he received the degree of mechanical engineer at Cornell University where he specialized in railway mechanical engineering. He began his railroad career in the summer of 1899 in the shops of the Philadelphia & Reading (now the Reading), at Reading, Pa., and upon graduation from Cornell went to West Burlington, Iowa, where he was employed in the mechanical department of the Chicago, Burlington & Quincy. Four years later Mr. Averill joined the staff of the Railway and Engineering Review of Chicago. On January 1, 1906, he became associated with the American Engineer and Railroad Journal and on April 1, 1910, was appointed managing editor. He continued as managing editor of the Railway Age Gazette, Mechanical Edition, when the American Engineer and Railroad Journal was incorporated with that paper upon its purchase by the Simmons-Boardman Publishing Company in 1911. On March 1, 1914, he resigned to become engineer of operation of the Standard Stoker Company. Upon the organization of the Locomotive Feed Water Heater Company in 1916, Mr. Averill, one of the organizers, became vice-president of that company. From March, 1921, when the Locomotive Feedwater Heater Company was taken over by the Superheater Company, until July, 1940, Mr. Averill was engaged in the service department of the Superheater Company.

◆

JOHN W. FOYLE, who for many years served as first vice-president of the Gustin-Bacon Manufacturing Company, Kansas City, Mo., died at St. Mary's Hospital in that city on February 27. Mr. Foyle was born at Parsons, Kan., October 4, 1879. Mr. Folye was educated at St. Mary's (Kan.) College, and served in World War I with the rank of major. He was employed on the Missouri-Kansas-Texas, the Wabash, the Chicago, Indianapolis & Louisville and the Erie prior to joining Gustin-

(Continued on page 110)

An informative message from Chrysler Corporation

NEW DESIGN FREIGHT CAR TRUCK DELIVERS HIGHER EFFICIENCY

CHRYSLER engineering research has always included vehicle "ride" —the design and construction that give superior riding qualities in the vehicles we make.

Revolutionary advances in cars and trucks have come out of this fundamental research. And our engineers became interested in applying these important principles of vehicle ride to serve American railroads and shippers.

In collaboration with railroads, we developed an advanced design Railroad Freight Car Truck which affords greater protection to goods in transit, even in capacity loading.

It is built with balanced suspension which absorbs both lateral and vertical track-originated shocks. It is efficient to operate and easy to maintain. Its durability, dependability and reduced wear have been demonstrated in several years and many miles of railroad freight and head-end service.

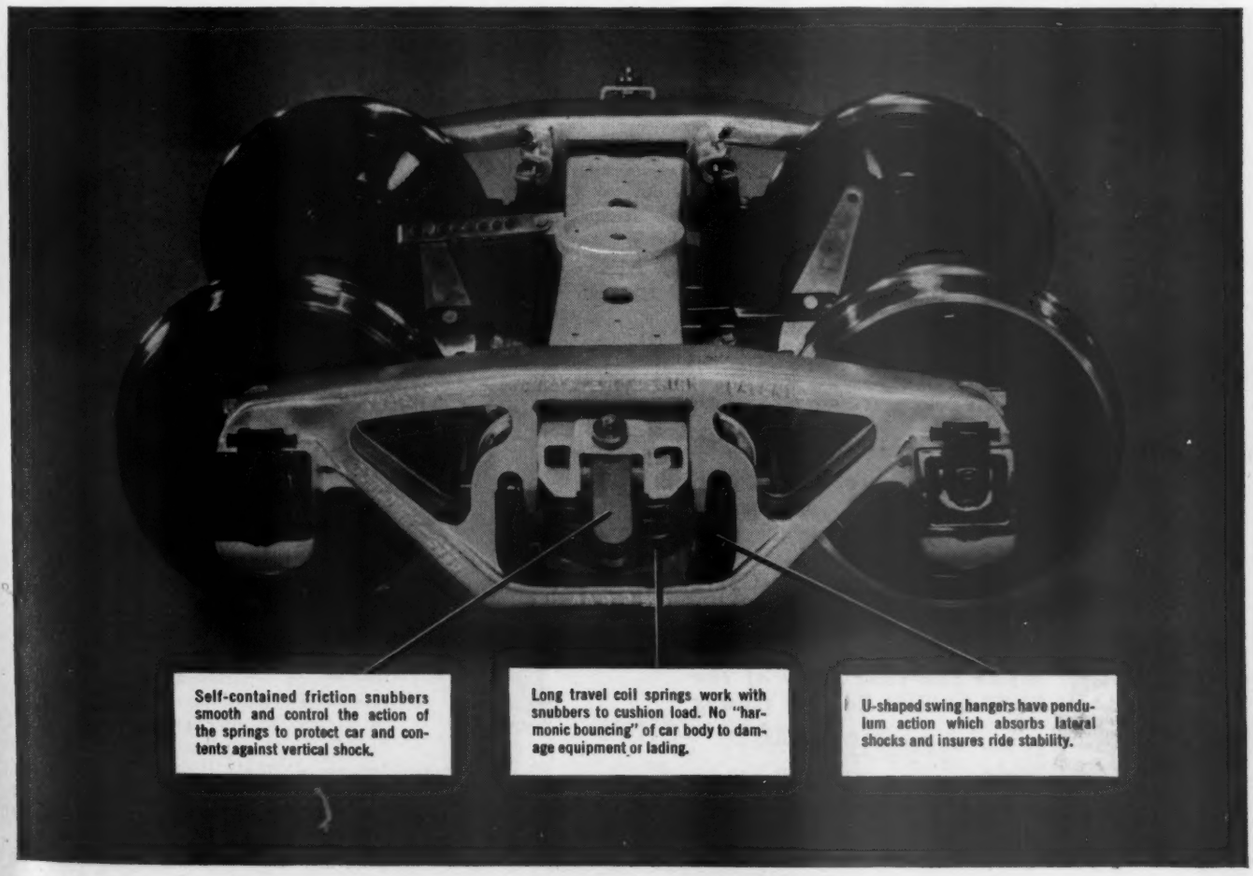
All segments of the transportation industry are vital to our nation's mobility. The development of this railroad truck stems from a basic automotive engineering advance, translated to the field of railroad transportation.

Chrysler Corporation felt that the best interests of the railroads would be served by extending to established manufacturers of railroad equipment the opportunity to produce this advanced unit. It is through such channels that it is available to American railroads.

Symington-Gould Corporation, Depew, N. Y., has been licensed to manufacture and sell the Chrysler Design Railroad Freight Truck. The self-contained friction snubbers—an important feature of the truck—are of Chrysler design and are manufactured and sold by the Houde Engineering Division, Houdaille-Hershey Corporation, Buffalo, N. Y.

The new trucks are already in use by many railroads on their freight cars, and they have been adopted for the General American-Evans Damage Free Box Car.

CHRYSLER CORPORATION


Self-contained friction snubbers smooth and control the action of the springs to protect car and contents against vertical shock.
Long travel coil springs work with snubbers to cushion load. No "harmonic bouncing" of car body to damage equipment or lading.
U-shaped swing hangers have pendulum action which absorbs lateral shocks and insures ride stability.

STOP RUST

Available in many colors, aluminum and white.

RUST-OLEUM can help you control rust—to cut your maintenance costs—and to avoid needless rust losses. It stops rust effectively—and prolongs the useful life of rustable metal so that costly replacements can be deferred years longer than previously could be expected.

Railroads find RUST-OLEUM the practical answer to many rust problems. Its tough, pliable film gives excellent protection to rolling stock, bridges, tanks, metal buildings, signal equipment and other properties.

CUT YOUR MAINTENANCE COST

Rescue metal that has already started to rust. RUST-OLEUM can be applied *even* over metal already rusted —usually without sandblasting or the use of chemical cleaners. Simply scrape and wire-brush to remove rust scale and loose rust. Then apply RUST-OLEUM by brush, dip, or spray. It stops the rust, and promptly dries to a firm, pliable, rust resistant protective coating.

Write for your copy of the RUST-OLEUM Railroad Catalog

RUST-OLEUM CORPORATION

2590 Oakton Street **EVANSTON, ILLINOIS**

Bacon in 1913 as a salesman, handling railway supplies. A few years later he became vice-president. His interest remained largely in the railroad department of the company, but when his health began to fail slightly three years ago, Mr.

John W. Foyle

Foyle gave up many of his railroad duties to devote his time to construction of the new Fairfax plant. He was a life member of the Purchases & Stores Division of the Association of American Railroads.

◆

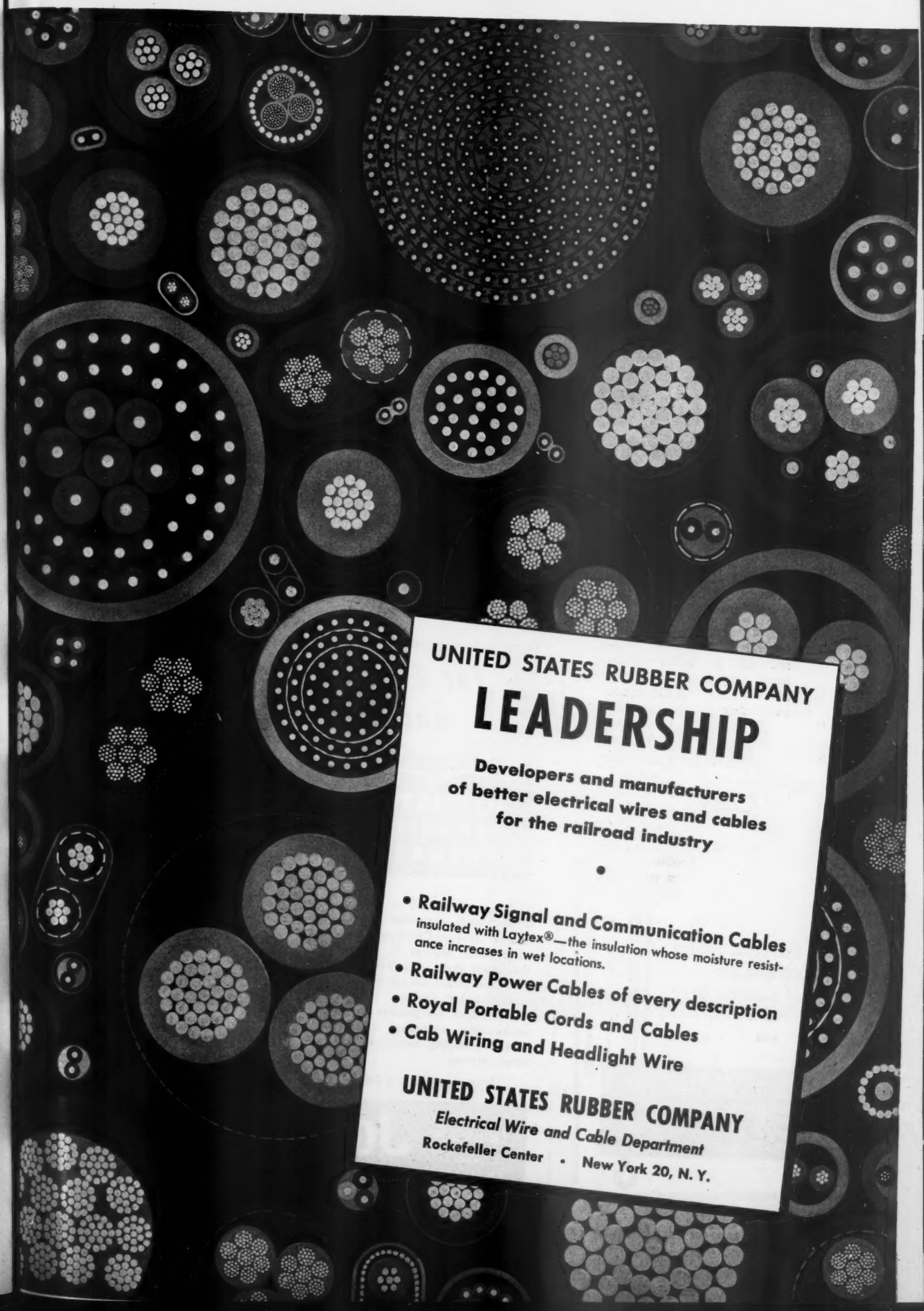
JOSEPH J. EDWARDS, vice-president of the O. M. Edwards Company, died recently while on a business trip in San Antonio, Tex. Mr. Edwards, born in Johnstown, N. Y., on January 8, 1887, was the son

Joseph J. Edwards

of Oliver Murray Edwards, who founded the O. M. Edwards Company in 1888. Early in his career he worked successively for the Southern and the Louisville & Nashville, after which he joined the O. M. Edwards Company.

◆

PAUL TRAEGER, formerly manager of the service department of the Simmons-Boardman Publishing Corporation, died on March 26, after an extended illness. Mr. Traeger was born in Germany on January 4, 1891. He received his early education in New York public schools and was a graduate of Cornell University in 1913 with a degree in mechanical engineering. During summer vacations of


UNITED STATES RUBBER COMPANY
LEADERSHIP
Developers and manufacturers
of better electrical wires and cables
for the railroad industry
•
• Railway Signal and Communication Cables
insulated with Laytex®—the insulation whose moisture resistance increases in wet locations.
• Railway Power Cables of every description
• Royal Portable Cords and Cables
• Cab Wiring and Headlight Wire
UNITED STATES RUBBER COMPANY
Electrical Wire and Cable Department
Rockefeller Center • New York 20, N. Y.

built for
LONGER USE

Reduce costly delays and bottleneck breakdowns eliminate need for a large supply of replacement parts. Equip your shops with Coffing Quik-Lift electric hoists. They're built to *stay on the job* — to give you continuous operation in the toughest day-after-day work.

backed by
BETTER SERVICE

Prompt, efficient Coffing service, with immediate shipment of parts further protects you against costly down time.

Put one or two Quik-Lifts on the job. Prove to yourself that for extra endurance backed by efficient service there is a difference in electric hoists.

COFFING Quik-Lift ELECTRIC HOISTS

Write
COFFING HOIST COMPANY
Danville, ILL.
for Bulletin
H5E

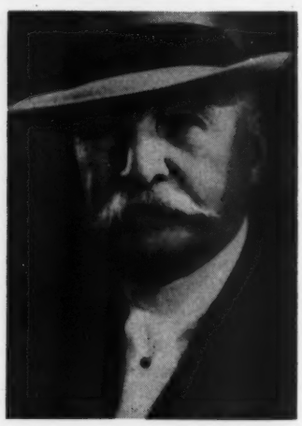
Hoist-Jacks • Safety-Pull Ratchet Lever Hoists • Mighty-Midget Pullers • Spur-Geared Hoists • Differential Chain Hoists • Load Binders • I-Beam Trolleys.

Paul Traeger

1911 and 1912. Mr. Traeger worked with the New York Central on third rail construction. From 1913 to 1915 he served as a special apprentice at the Harmon, N. Y., shops and, in the latter year, entered the road's electrical engineering department. He left in 1916 to join the Aetna Explosive Company, Emporium, Pa., and worked successively as master mechanic and mechanical engineer. Mr. Traeger became associated with Simmons-Boardman in 1918 working as advertising copy writer. In 1927 he was appointed assistant manager, service department and in 1931 manager of the department. On October 10, 1949, he received a leave of absence because of ill health.

◆

DAVID C. BALL, organizer and chairman of the board of directors of Oakite Products, Inc., died on March 23 at his home in Lake Placid, N. Y. Mr. Ball, who was 93 years old, organized the Oakly Chemical



David C. Ball

Company in 1909 and later became its president. In 1926 the name of the company was changed to Oakite Products, Inc. Mr. Ball became chairman of the board of directors in 1949.

For Efficient Annealing and Stress Relieving . . .

JOHNSTON CAR BOTTOM FURNACES

Engineering experience is apparent in the smooth mechanical operation of the Johnston Car Bottom Furnace. Roller bearings in car and door hoist shafts, and power operated car pullers are just a few of many practical features. Johnston "Reverse Blast" low pressure burners assure clean, economical, efficient heat for annealing, normalizing, and stress relieving.

Write for Bulletin R-240

Over Thirty Years Experience in the Design and Manufacture of

Burners • Blowers • Furnaces • Rivet Forges Fire Lighters • Tire Heaters • Allied Equipment

THE JOHNSTON LINE — SAFETY DEPENDABILITY

JOHNSTON MANUFACTURING CO.
2825 EAST HENNEPIN AVE.
MINNEAPOLIS 13, MINN.

ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

Modernization that includes *Thermopane** Eliminates . . .

THIS

and THIS

and THIS

WITH *Thermopane* ALL YOU DO IS THIS

"It isn't only the initial cost—it's the upkeep."

Bear this in mind when the choice of car windows comes up in connection with your conversion program. Maintenance costs can quickly eat up any real or fancied savings effected by using conventional double-window construction.

Equally important, the basic purpose of modernization may be defeated by a choice of less-than-best equipment. The fundamental objective of all car modernization programs is increased passenger revenue. That, in turn, depends on increasing passenger satisfaction.

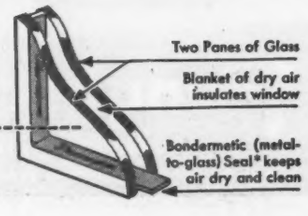
Only *Thermopane* insulating glass offers this combination: added visibility and greater comfort for passengers—*at lower maintenance cost to you.* This sealed-at-the-factory, double-glass windowpane requires washing only on the two exposed surfaces. There's no condensation or annoying film between the panes. Give your passengers clear view—and your window washing crews a time-saving, expense-saving minimum job—with *Thermopane.*

May we give you more information, in terms of your special requirements? Libbey·Owens·Ford Glass Company, 3851 Nicholas Building, Toledo 3, Ohio.

*®

L·O·F GLASS *Thermopane* LOOK FOR THE NAME ON THE SEAL BETWEEN THE PANES

FOR BETTER VISION SPECIFY THERMOPANE MADE WITH POLISHED PLATE GLASS



CLEAN
Diesel-Electric Motors Without Solvents

NO Drying Periods, NO Toxic Hazards with NEW Pangborn AC-4 Blast Machine

The new, fast, safe and inexpensive way to clean motors and generators is with a Pangborn AC-4 Blast Machine. Soft, 20-mesh corncob grits whisk away grease, oil, paint flakes, etc., in scouring armatures, frames, coils and other parts. (See photo above.)

There's no danger from caustic action, no time lost waiting for work to dry. Corncob blast machines operate on standard 40-lb. air supply. Cost of materials averages 90% less and cleaning is done in one-third the time it takes to clean with solvents.

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Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

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BLAST CLEANS CHEAPER with the right equipment for every job

PERSONAL MENTION

General

ERIC G. ECKLUND, superintendent of motive power, of the Rutland, has been appointed general superintendent.

J. W. GANN, master mechanic of the Chicago, Rock Island & Pacific at Armourdale yards, Kansas City, Kan., has been appointed superintendent motive power, first mechanical district, with headquarters at Chicago.

H. M. HOFFMEISTER has been appointed engineer of tests of the Missouri Pacific Lines, with headquarters at St. Louis, Mo.

S. R. TILBURY, fuel supervisor Eastern Lines, of the Atchison, Topeka & Santa Fe at Topeka, Kan., retired on March 1 after 38 years of service.

L. H. KUECK, assistant chief mechanical officer of the Missouri Pacific Lines at St. Louis, Mo., has retired.

PHILIP H. HATCH, general mechanical superintendent of the New York, New Haven & Hartford at New Haven, Conn., has retired after 28 years of service with that road.

KENNETH CARTWRIGHT, chief mechanical engineer of the New York, New Haven & Hartford at New Haven, Conn., has been appointed general mechanical superintendent at New Haven.

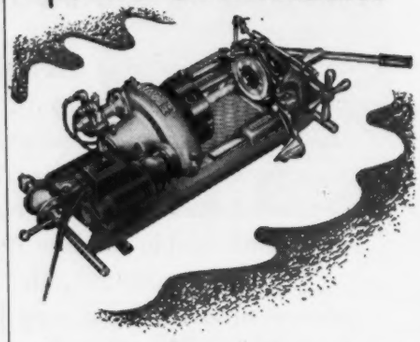
CARL A. LOVE, general master mechanic of the Louisville & Nashville, has been appointed an assistant superintendent of machinery, with headquarters at Louisville, Ky.

HENRY E. WHITENER, who has been appointed superintendent motive power and rolling equipment of the Central of New Jersey at Elizabethport, N. J., as announced in the March issue, was born on September 5, 1895, at Hickory, N. C., where he attended high school and Lenoir College. He

Henry E. Whitener

• LIGHTWEIGHT
• LOW-PRICED
• EASY-TO-MOVE

the New Beaver Model-E Pipe and Bolt Machine



The new low-priced, lightweight Beaver Model "E" is a "junior edition" of the heavy-duty Beaver Model A—which has, for the past 20 years, been the recognized leader in the field of portable pipe and bolt machines.

The Model "E" uses the same dieheads—the same dies—the same patented interchangeable wheel-and-roller or knife cutoff devices—the same reamer arm and cone—as the Models A and B. This will be a great advantage to thousands of shops now equipped with the Beaver Model A or B because it eliminates the necessity of carrying in stock duplicate dies and parts—thereby preventing endless confusion and needless expense. And remember, there are 195 different kinds and sizes of dies instantly available for Models A, B or E.

Although designed primarily for hardware stores and small piping contractors, BIG contractors will find the new Model "E" useful on jobs requiring extreme portability.

A pipe machine is no better than the service back of it and our 50 years of experience in this field, and our reputation for high quality and friendly service, is your best guarantee of complete satisfaction.

WRITE FOR BULLETIN E

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Now, ALL Railroads can put wheel mounting and demounting operations on a real production basis with new, modern W-S Wheel Mounting and Demounting Presses.

Incorporating outstanding design and construction features, these latest developments of W-S Engineers provide the fastest cycle of operation ever attained in this type of equipment, and they handle any type of wheels.

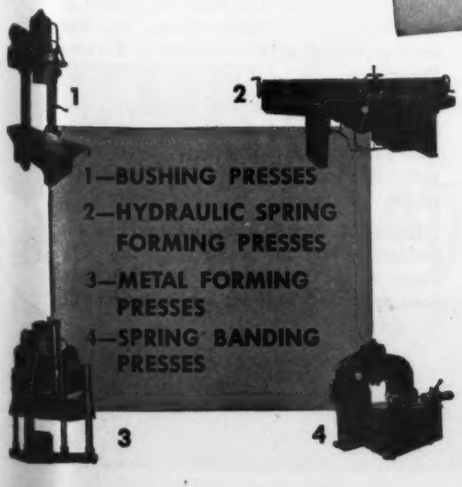
300 TON STRAIGHT THROUGH MOUNTING PRESS

MOUNT and DEMOUNT in Seconds with NEW W-S WHEEL PRESSES

Smashing time records daily, these New Watson-Stillman Speed Presses permit YOU to set your own floor-to-floor speed time—and this is only limited by your loading and unloading facilities.

Get the story today from one of the W-S Representatives listed below.

600 TON STRAIGHT THROUGH DEMOUNTING PRESS



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New York 17, N. Y. ..... Eastern Railway Supplies, Inc.
St. Paul 4, Minn. ..... Anderson Machine Tool Co.
San Francisco 5, Calif. ..... Overland Supply Co.
Washington 5, D. C. ..... Ralph Payne

9-K.12

entered railroad service on October 1, 1913, with the Carolina & Northwestern at Hickory as an apprentice. During 1916 and 1917 he was with the Southern as a machinist at Spencer, N. C. He subsequently served in the United States Army Air Corps. In 1919 he joined the Baltimore & Ohio as foreman at Fairmont, W. Va., becoming general foreman at Parkersburg, W. Va., in 1920 and assistant master mechanic at Holloway, Ohio, in 1922. He was transferred to Cumberland, Md., in 1926 and from 1927 to 1930 was shop superintendent for the Chicago Great Western at Oelwein, Iowa. From 1930 to 1937 he was foreman for the Central of New Jersey at Jersey City, N. J., and in 1937 became general locomotive inspector of the Reading at Reading, Pa. In 1939 he was appointed shop superintendent of the C.N.J. at Elizabeth, N. J., and in 1942 master mechanic at Jersey City.

E. C. MEINHOLTZ, engineer of tests of the Missouri Pacific Lines at St. Louis, Mo., has been appointed mechanical engineer, with headquarters at St. Louis.

GEORGE J. HIGGINS, superintendent of the Readville (Mass.) shops of the New York, New Haven & Hartford, has been appointed assistant general mechanical superintendent.

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JUST 3 SIMPLE STEPS
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Car Department

B. F. ORR, superintendent of the Beech Grove, Ind., car shop of the New York Central, after 45 years with the company, has retired.

SYLVESTER H. KAYS, general foreman car repairs of the Southern at Chattanooga, Tenn., has been appointed general foreman car repairs at Princeton, Ind.

JOSEPH F. CLEMO, assistant general foreman car repairs of the Southern at Birmingham, Ala., has been appointed general foreman car repairs at Meridian, Miss.

NORMAN A. PASSU, supervisor, car construction, of the Southern Pacific, has been appointed engineer, car construction, with headquarters at San Francisco, Cal.

Master Mechanics and Road Foremen

T. J. SHERRIDAN, acting master mechanic, Chicago division, of the Pennsylvania, has been appointed master mechanic of the same division.

R. J. PARSONS, assistant master mechanic of the New York Central at Albany, N. Y., has been appointed master mechanic at Avis, Pa.

P. J. BIGGAN, master mechanic of the Chicago Rock Island & Pacific at Goodland, Kan., has been appointed master mechanic of the Missouri-Kansas divisions with headquarters at Armourdale, Kan.

E. ROSS HANNA, master mechanic of the Missouri Pacific at Nevada, Mo., has retired after 26 years of service with the M.P. Lines.

C. B. CAMP, general foreman locomotive department of the Chicago, Rock Island & Pacific at El Reno, Okla., has been appointed master mechanic of the Western division, with headquarters at Goodland, Kan.

Shop and Enginehouse

V. L. MINNICK, foreman of the Norfolk & Western at Lynchburgh, Va., has been appointed general foreman at Williamson, W. Va.

C. S. PATTON, JR., general foreman of the Norkfolk & Western at Williamson, W. Va., has been appointed general foreman, locomotive department, at the Roanoke, Va, shops.

J. P. ROUDABUSH has been appointed assistant foreman in the machine shop of the Norfolk & Western at Roanoke, Va.

A. T. PARNELL, electrician supervisor of the Southern at Pinners Point, Va., has been appointed general foreman at Pinners Point.

JAMES C. WADDLE has been appointed general foreman of the Southern at Chattanooga, Tenn. Mr. Waddle was previously general enginehouse foreman at Chattanooga.

DUANE A. GORMAN, assistant to the superintendent of the South Louisville, Ky., shops of the Louisville & Nashville, has been appointed assistant superintendent of the shops.